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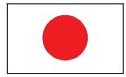
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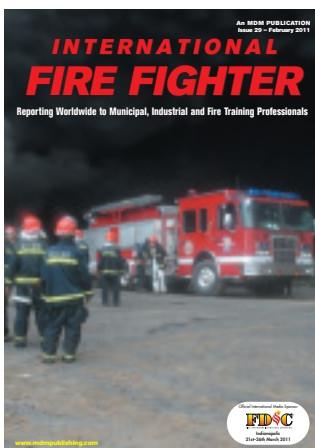
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Firefighters work at the oil pipeline blast site in Dalian, a port city in northeast China's Liaoning Province, July 16, 2010. More than 2,000 firefighters and 338 fire engines from 14 cities across the province worked through the night to extinguish the fire.

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Graham Collins

Fire & Rescue

I am old enough to remember when the Fire & Rescues service was known universally by the truncated name of Fire Brigade. In fact, I am not at all sure that I know when the "& Rescue" was added to the name, but there is no arguing the fact that Fire & Rescue Service is a much deserved and more representative description.

Why do I say this? And why choose this particular moment to say it?

Well, my personal experience of rescue operations was, until very recently, limited largely to what I saw on the television screen, watching training exercises and talking with equipment manufacturers. However, I now live and work in Queensland, Australia and have seen first-hand just what a major rescue operation really looks, sounds, feels and smells like. The Queensland floods have been judged to be Australia's biggest ever natural disaster (and that takes some doing after the Victoria "Black Saturday" bushfires in 2009) bringing home once again the need for disaster preparedness, emergency response planning, logistics support, equipment availability, training, manpower availability and so on.

In a savage twist of irony, the floods came nearly a year to the day when, 15,000 kilometres across the Pacific, another "worst ever" struck the impoverished Island of Haiti. The earthquake that struck Port-au-Prince resulted in statistics that most of us – thankfully – can only gasp at: 345,000 people killed; 45,000 people still unaccounted for; more than 500,000 displaced; and 1.5 million people homeless. Solely to put this into some sort of perspective, the Haiti earthquake caused more deaths than the atomic bombing of both Hiroshima and Nagasaki.

So it is important to take such events out of the realm of statistics and in this edition of International Fire Fighter we have a retrospective article

on the Haiti USAR by Mike Thomas, the man who led the British contingent. Some of his comments ought to make all of us stop and think, because something similar is going to happen again. Where and when is anybody's guess, but in the past 30 days the USGS (United States Geological Service) has recorded six major earthquakes in the USA, Latin America and the Pacific, and while Queensland was submerged in flood water, 500 people were killed in floods and mudslides in Brazil and 40 people lost their life in floods in South Africa.

When you look at these casualty figures, you cannot help but notice a recurring chilling characteristic, namely how many of these disasters hit the poorest and least equipped communities. And it is not just the size of the disaster; equally important is the affected country's inability to construct buildings and highways that withstand natural disasters, and have the resources trained, equipped and in place to deal with an emergency the moment it strikes.

Comparison illustrates what I am getting at. Australia is a wealthy, developed country with highly skilled emergency response resources. The death toll from the Queensland flood currently stands at a tragic figure, but less than 20, and many parts of the country are already returning to something at least approaching normality. Haiti is about as poor as you can get, and little has changed in the 12 months since disaster struck.

The efforts of firefighters like Mike Thomas and his team, and the other firefighters from around the world that "answer the call" are a humbling example to us all. They are also a reminder that sharing experiences, techniques and knowledge is a laudable aim, and one that International Fire Fighter will strive to continue to do in 2011.

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Cutting Power That Counts



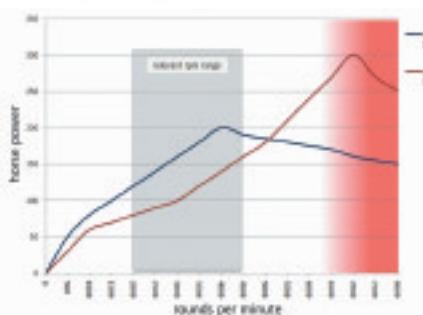
Carsten Sauerbier

Director of Technical Innovation and Development at LUKAS Hydraulik

When purchasing a new cutter, you might be tempted to compare the theoretical maximum power values quoted in technical specifications and choose what appears to be the most powerful device. But theoretical figures are not the same as real-life cutting performance.

Comparing the theoretical maximum forces of a cutter is much the same as comparing a car's theoretical maximum horsepower without taking the relevant rpm-range into account. For example, if a car has a theoretical maximum horsepower of 300, but this only comes into effect at more than 7000 rpm, this is worse than a car that might generate its maximum horsepower of 200 in a range of 2000 rpm to 4000 rpm.

The graphic below shows that the car with the minor theoretical horsepower is superior at the real-world rpm range.



What matters is where the real work is done!

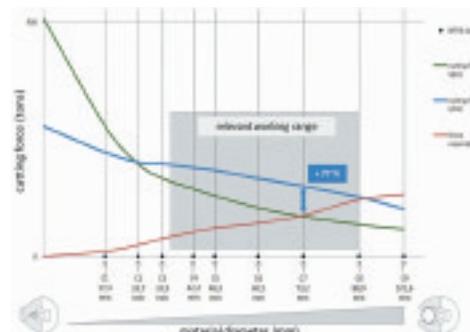


When you cut an A-pillar or B-pillar in a vehicle, the material is initially crushed by the blades until the point of greatest resistance is reached and the actual cutting starts. This is reached when the material in question has a diameter of between 40mm and 90mm, as shown below showing the relevant working range. This is where you need the greatest force at the right point on the blade.

Superior performance is more important than calculated values

The graphic shows that the theoretical maximum cutting force applies at a material diameter close to zero, which in reality is completely irrelevant. It also shows that maximum forces apply at small material diameters where the force that is required to cut the material is very low (the red line). The blades on the new LUKAS S 700 and S 700 E cutters are specifically shaped to deploy a high degree of power at the front blade section, making them more suitable for cutting the larger diameters encountered by rescuers in real-life situations.

For more information, go to www.lukas.com



S 700 and S 700 eDRAULIC offer up to 77 percent more cutting power exactly where profiles of a car body are cut

EN and NFPA – what is behind these standards?

For standardised tests for hydraulic rescue tools, the European Standard EN 13204 provides good reference values as performance in practice, rather than theoretically-simulated maximum forces are taken into consideration.

Those, who want to know what performance a tool is really capable of should take the NFPA (National Fire Protection Association) 1936 Standard into account, because of its more stringent requirements, and because the NFPA tests rescue tools under the most extreme conditions. NFPA evaluates a performance level that is by far higher than the level recorded by EN testing, so the differences between the strongest cutters become very clear.

The NFPA Standard continues to test with even thicker steel materials after the EN standard has already awarded the best test result; a reaction to the demands at rescue sites where cars with high-strength materials and larger diameter components need to be cut.

IFF

NFPA Cutter Class	Number of cuts	S 510		S 700 (E)	
		C	D	C	D
2	12	28.7 x 2.8	44.6 x 1.6	28.7 x 2.8	44.6 x 1.6
3	12	33.8 x 3.3	26.4 x 2.0	33.8 x 3.3	26.4 x 2.0
4	12	42.2 x 3.6	31.8 x 3.0	42.2 x 3.6	31.8 x 3.0
5	12	48.3 x 3.8	38.0 x 3.0	48.3 x 3.8	38.0 x 3.0
6	12	60.6 x 3.8	44.6 x 3.0	60.6 x 3.8	44.6 x 3.0
7	12	73.2 x 6.1	60.6 x 3.6	73.2 x 6.1	60.6 x 3.6
8	12	88.0 x 6.6	63.6 x 4.6	88.0 x 6.6	63.6 x 4.6
9	12	102.0 x 6.6	76.2 x 4.6	102.0 x 6.6	76.2 x 4.6

The NFPA test shows the differences in performance of the strongest cutters

Brigade Praise For Firefighting Gel

TetraKO, an environmentally friendly, patented Class A water additive that transforms ordinary water into an adhering liquid that can be pumped through standard firefighting equipment has been praised for its role in saving a Minnesota local community church. The firefighting gel, manufactured by EARTHCLEAN CORPORATION, was used by the Spring Lake Park/Blaine/Mounds View (SBM) Fire Department to bring the fire under control in 15 minutes, saving the building and much of its contents, with minimal water damage.

By the time the firefighters arrived, the blaze had already extended through the building's roof. "We were amazed that this building did not burn to the ground," said SBM District Fire Chief, Doug Nelson. Nyle Zikmund, SBM Fire Chief continued the



story: "After initially hitting the fire and hot spots with TetraKO, I advised division command to discontinue application and allow TetraKO's steam conversion to occur.

The steam cloud increased dramatically in size, and remained for an extended period of time. Crews continued to monitor and listen with no further evidence of fire."

TetraKO is an environmentally friendly additive that is reckoned to be far superior because its proprietary dual thickening, which allows it to adhere and stay where applied. When heated by fire, TetraKO becomes even thicker and releases a dense steam, dramatically aiding fire suppression. It does not use super absorbent polymers; is third-party certified, and uses EPA (Environmental Protection Agency) and the Organization for Economic Co-operation and Development (OECD) standards for biodegradability and toxicity.

For more information, go to www.tetraKO.com

New manual monitor unveiled



A new manual monitor has been added to the AKRON BRASS offering of manual and electric water cannons. Described by the company as compact, high performing and cost effective, the Style 3430 monitor is

rated for flows up to 3800 litres-a-minute and offers continuous 360° rotation.

The new monitor has a rugged, lightweight design – it weighs just seven kilograms – and features a "T" dual-handle tiller bar design for maximum control and precise positioning with an elevation range of +90° to -45°, has a built-in pressure gauge, requires minimum mounting space, and is said to be ideal for all master stream firefighting needs. It incorporates cast-in turning vanes and an integrated stream shaper for maximum reach and stream performance.

For more information go to www.akronbrass.com

Compact And Portable Gas Detection

A new portable gas detector offering multi-gas detection of H₂S, CO, Oxygen and combustibles, and designed to deliver low-cost, multi-gas solutions with one-button simplicity has been unveiled by BW TECHNOLOGIES BY HONEYWELL. GasAlertMicroClip XT is being promoted as being an attractive choice for a wide variety of applications, thanks to its range of additional functionality.

Features being highlighted include IP66/67 protection, IntelliFlash, which provides a visual indication of current operation to both the user and supervisor, together with "force bump test" and "force calibration" functionality that helps to ensure that it is always fully maintained and ready to detect gas. It has a simplified and tamper-proof single button operation and an intuitive interface to reduce training time. Its slim and compact design is said to make it easy and comfortable to wear.

GasAlertMicroClip XT is compatible with MicroDock II to provide a quick and simple solution to portable bump testing.



For more information, go to www.gasmmonitors.com

New Community Safety Vehicle

Community safety has been given a boost by the UK's DEVON & SOMERSET FIRE & RESCUE SERVICE with the commissioning of a purpose-built community safety vehicle. It will be used to deliver interactive teaching sessions using the Internet and fire service approved presentations in schools, with focus groups and at multi-agency events throughout the two counties.

The new appliance incorporates wheelchair access, and the exterior design closely resembles the appearance of a fire appliance, utilising many genuine fire service components including locker shutters, pump, livery and emergency lighting. To boost the realism for young children, the vehicle is equipped with replica fire fighting kit, a low-pressure operated hose reel and a dummy breathing apparatus set.

For more information, go to www.dsfire.gov.uk



Gas Detector Ticks The Boxes

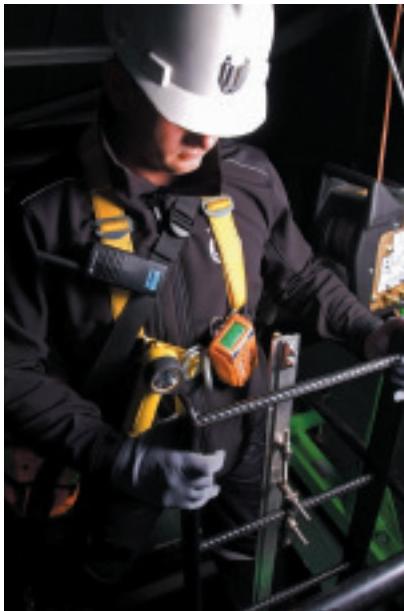
According to CROWCON DETECTION INSTRUMENTS, its Gas-Pro portable gas detector is designed specifically for confined space entry applications; it is reliable, simple to use, and robustly constructed with an easy-to-read display and a long-life battery.

The new Gas-Pro is comparable in size to leading front-mount diffusion detectors. It is designed so as not to get in the way of other items of personal protection equipment (PPE) and accessories and not to interfere with the wearer's primary activity. It has a bright, clear top-mount display that can be read at a glance without having to even touch the detector. A dual-colour backlight adds an extra level of alert should the Gas-Pro enter alarm status.

An internal pump means that pre-entry testing can be done quickly and easily. This also keeps the size of the detector small and removes the problems of poor sealing or the need for extra equipment and chargers associated with parasitic pumps. It has IP65 and IP67 ingress protection with an extremely loud >95 dB alarm, as well as a vibrating and dual-colour visual warnings as standard.

Gas-Pro can detect up to five potentially hazardous gases from a wide range including, hydrogen sulphide, carbon monoxide, carbon dioxide, oxygen and flammable gases, as well as industry-specific gases such as ozone, ammonia, chlorine, chlorine dioxide and sulphur dioxide.

For more information go to www.crowcon.com



Thermal Imager Offers More

A new thermal imaging camera that is claimed to be much more than solely used for fire fighting has been introduced by FLIR SYSTEMS. The company says that it can also be used for support applications, scene assessment, incident investigation, search and rescue activities and firefighting prevention.

Depending on the configuration, the light and compact hand-held FLIR HF enables users to see objects over distances of between 400 metres and 1.2 kilometres, which is particularly useful when fighting large-scale industrial, wildfires or maritime fires and generally in search and rescue work. It requires no light to provide a crisp 320 pixel by 240 pixel image on which the smallest details can be seen without the need for adjustment. It also enables the firefighter to see through smoke and take temperature measurements.

Features include a spot temperature measurement meter that shows the temperature at the centre of the image. If this exceeds 150°C, the top part of the temperature scale turns red, giving an instant indication that further steps need to be taken to extinguish the fire. The camera is fully controlled via just five buttons.

Four models are available, each with different performance features. The standard package comprises the camera, four rechargeable batteries, hot-shoe charging and video output attachment, car power adaptor, video output cable, AC charger, lanyard and manual.



For more information, go to www.flir.com

Airport's Strikers Make Their Mark In Denver

The addition of two new aircraft rescue and fire fighting (ARFF) vehicles at Denver International Airport in Colorado brings the total number of OSHKOSH vehicles operating at the airport to seven. The two new Oshkosh Striker 4500 vehicles are expected to be delivered in April, and will join four existing Striker 4500s and one Striker 1500 model already on duty at the largest airport in the United States, and the third largest in the world. In 2009, the airport handled over 50 million passengers, making it the tenth busiest passenger-traffic airport in the world.

The Striker 4500 features an 8 by 8 axle configuration and proprietary technologies such as TAK-4 independent suspension, triple-agent firefighting capabilities and Command Zone advanced electronics. It has pre-connected water and foam hoses and carries 17,000 litres of water, 1,590 litres of foam, and 227 kilograms of dry chemical agent. The vehicle's roof turret has 4,542 litres-a-minute flow capacity, while a high-volume, low-attack bumper turret with Hydrochem nozzle also has a flow of 4,542 litres-a-minute.



The Oshkosh Corporation Airport Products' Striker 1500 is on duty at the Denver Fire Department ARFF Training Academy located within the airport grounds. This cutting-edge facility trains firefighters from around the world in the most advanced

methods of fighting aircraft fires. It boasts 16 state-certified instructors, interactive technology and a full-scale aircraft mock-up.

For more information, go to www.oshkoshairport.com.

Brigades Get New Versatile Alert



The latest development in advanced firefighting electronics and telemetry from SCOTT HEALTH & SAFETY is the Alert ATS. It is described as offering fire brigades the opportunity to create a system that meets their exact requirements. In its most simple configuration, the upgradable modular device operates as an evacuation two-way radio signalling device while, at its most advanced level, it can be operated as a fully-computerised entry control management system with digital tally board.

Scott says that the Alert ATS was developed in response to feedback from firefighters indicating that they wanted improved entry control procedures, simplicity of use, clear status information and evacuation control. A new digital pressure gauge ensures immediate awareness of the air supply levels, time to whistle and temperature data, providing the confidence to continue working regardless of the surrounding risk. The permanently back-lit screen provides a clear and easily readable display containing all the required information to eliminate the need to scroll, while visual warnings alert the user and nearby colleagues. The one button operation unit logs all data for downloading.

For more information, go to www.scotthealthsafety.com

USAR Camera Offers Greater Versatility

A new victim location camera has been launched by CON-SPACE COMMUNICATIONS. The new SearchCam



3000 is claimed to be a new concept in urban search and rescue cameras; one that can be also be used for vehicle extrication, in shafts, underwater or for fire investigation.

The camera is powered by lithium ion battery sticks, which are interchangeable with the Delsar LifeDetector batteries. The Video Display Unit (VDU) is attached to a power module via a mechanical quick-disconnect and the coiled cable allows for the VDU to be held up to two meters away from the power module. The 240° articulating camera has built-in audio and provides rescuers with the ability to see and communicate with trapped victims. A clutch-equipped gear box protects the motor and the gears from damage during use.

The quick disconnect feature provides rescuers with imaging flexibility; a full-resolution colour camera with LED lighting, or black-and-white imaging with infrared lighting. The camera can be lowered into dusty, harsh and wet void spaces, providing teams with a clear well-lit view of the search area. With the environmental sleeve installed, the camera head can be submerged in water up to 23 meters deep, and interchangeable tube sets allow the extension of the camera to reach between 338cm and 566cm. Files from the SearchCam can be uploaded to a computer for playback, archive and search review purposes.

For more information go to www.con-space.com

Hand-held Portable Boosts Safety

A hand-held portable radio incorporating a new Lifeguard feature – also known as man-down – that can be activated with one key press has been unveiled by CASSIDIAN. When a user activates Lifeguard, the radio automatically sends a message to a predetermined number. If the radio stops moving or remains horizontal for too long, it triggers a local man-down alert. If the user does not respond, the radio automatically activates an emergency call and sends its coordinates to a predefined destination over the Tetra network.

IP65 protection class gives the new THR9i handheld resistance to dust and water, while its metallic chassis and the new front cover design protect it against shocks. The large QVGA (Quarter Video Graphics Array) colour displays information clearly,



enabling it to capture mission critical data at a glance. Key features of the radio include clear sound and an excellent audibility for voice calls, even in noisy environments. A GPS-based "where are you" feature shows on the radio display during a call, and it is possible to save these locations as waypoints for later use.

The THR9i can receive and host applications that can be customised to meet specific needs, and a terminal management tool allows several radios to be updated and re-configured simultaneously. It comes with a wide range of audio accessories, a car kit with an automatic connection to an external antenna, and two battery options.

For more information go to www.cassidian.com

MSA Launches New Multi-gas Detector



MSA has added to its Altair line-up of portable instruments with the introduction of the new Altair 4X Multigas Detector, driven by MSA XCell sensor technology. It is claimed to offer a number of performance advantages including a standard three-year warranty, four-year sensor life, faster response time, increased stability, and less than 60-second span calibration time.

It is compatible with the ALTAIR 4 Galaxy Test Stand, and can incorporate optional MotionAlert and InstantAlert features.

For more information go to www.MSAnet.com



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INTERNATIONAL FIRE FIGHTER

11

RollNRack Hose Management System



Javier Fernandez

RollNRack

Owner and CEO, Javier Fernandez, is a career active-duty firefighter with twenty years experience. After injuring his back with large diameter hose, he dedicated his time to designing a portable tool for fire hose loading that would prevent back injuries – back-strain injuries are the number-one reason for disability retirement of firefighters across the USA. The unit would also stretch manpower, and remain NFPA (National Fire Protection Association) compliant throughout the process, without having firefighters ride precariously on top of moving apparatus.

RollNRack, LLC – a family company serving the fire service with respect and appreciation – introduced the RollNRack unit in 2003. In 2004, a large diameter hose drain attachment for long, straight lays was introduced. Still pushing innovation, the Power Roller was introduced in 2008 and has set the standard for fast, easy draining, rolling and loading of all hose. It is the world's only portable, battery operated, large diameter fire hose roller. A single firefighter can drain and roll a 30-metre length of large diameter hose in under thirty seconds.

When loading rolls of hose with this system, only two firefighters are needed. This frees-up valuable firefighters for other tasks. With shrinking budgets, higher workman's compensation insurance, an aging workforce, the current shortages in the volunteer ranks, and expanding coverage, the RollNRack equipment makes a difference.

The Power Roller's coupling jaws can also be easily swapped to accommodate other hose couplings, and the hose rolling capacity is between 900 metres and 1200 metres on a single charge of the rechargeable battery pack. The portable units can be transported in a support vehicle or even in some apparatus compartments.

Industrial departments often order the XL Efficiency Package. Introduced in 2010, this package safely drains and rolls up to 45 metres of 185mm hose in just thirty-five seconds and can be loaded by two or three firefighters in one minute.

Javier Fernandez is a hands-on owner and demonstrates the RollNRack equipment at trade shows around the USA, and seems to be determined to be the hardest working guy at each show, running continuous demonstrations on how RollNRack tools tame fire hose – large diameter hose in particular.



"Our patented system can be tailored to a department's needs, and the equipment makes a back-breaking job easier, faster and more importantly, safer," Javier Fernandez states. "If they just want to transport and load large diameter hose, they can do that. No hose roll lifting and loading is done with two firefighters with our standard unit, and our drain attachment will drain long, straight large diameter hose lays faster and safer than shoulder draining." He continues: "You manually roll the hose, but you also benefit by using the correct body mechanics and never having to lift the roll of large diameter hose. The Efficiency Package gets you everything you need, and no other system on the market today offers such a return on investment for fire hose management with ease of operation and portability." Javier concludes with the news that: "For 2011, we have introduced a manual hand roller for 38mm and 45mm hose."

IFF

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For more information, go to
www.rollnrack.com

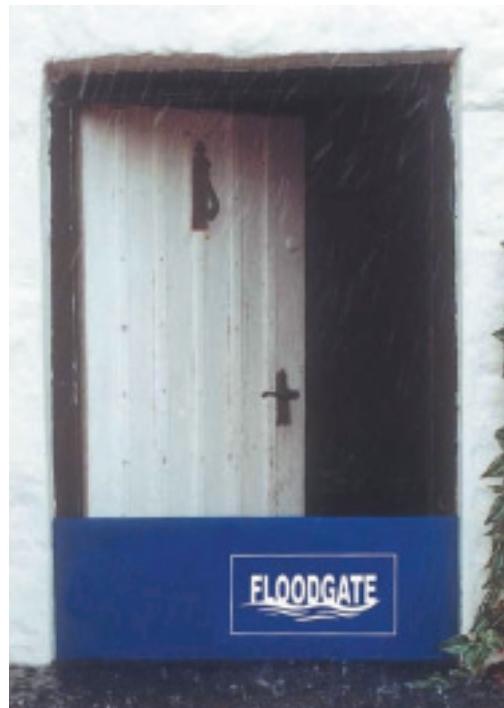
Flood Protection Device Is BSI Kite-Marked

A flood protection device developed in cooperation with the University of Wales and the Welsh Office, has become one of the first flood barriers of its kind to be accredited with the BSI Kitemark. FLOODGATE launched its domestic doorway flood barrier more than a decade ago and, today is available worldwide with annual sales of 2000 units.

The Floodgate barrier comprises a boxed tube metal frame that expands telescopically, firstly on the horizontal plane and then on the vertical. This frame locates in a 7mm thick rubber envelope that takes just minutes to install, and comes complete with all of the equipment necessary for successful installation.

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21st to 26th March 2011

Indiana Convention Centre, Indianapolis, USA

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EuroFire 2011

25th to 27th May 2011

Ecole Militaire, Paris, France

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www.eurofireconference.com



Emergency Situations: Prevention and Elimination

8th and 9th June 2011

Minsk, Belarus

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Safe Landings

The flying public has an expectation of safety when visiting an airport. In particular, they expect around-the-clock fire safety to be a "given" no matter how catastrophic the incident may be.

Airports are complex environments and, when there is an emergency, Airport Rescue and Firefighting (ARFF) firefighters must be able to respond immediately in specialised, high-performance, high-speed firefighting and rescue vehicles; arriving at the scene ready to tackle the emergency in a matter of a few minutes. The reality is that they may be facing an aircraft fire with anything up to 400 panic-stricken passengers, all trying to escape at the same time in any way they can through several doors or hatches, albeit that statistics suggest that around 80 percent of aircraft crashes occur away from the airport.

It is a highly specialised area of firefighting – many argue that it is a world apart from the work undertaken by municipal counterparts – and involves swift response, hazard mitigation, evacuation and rescue of passengers and crew of an aircraft involved in an airport ground emergency.

Speed is of the very essence, due to the potential for the incident to escalate quickly into a mass-casualty event. So, the ARFF team's initial response is understandably to secure the aircraft against the outbreak of a fire (assuming that the aircraft is not already ablaze), and increase the survivability potential of the passengers and crew. For this, these specialist firefighters have advanced training in the use of firefighting foams and dry chemical extinguishing agents that have been developed to extinguish burning aviation fuel in and around an aircraft. The objective, of course, is to establish as safe as possible an evacuating route from the stricken aircraft.

Having achieved hazard mitigation and the safe evacuation of ambulatory passengers, the next task is to endeavour to rescue trapped passengers and crew members. This can call for both firefighters

and support rescue personnel. In a mass casualty incident this often means employing triage – determining the priority of patients' treatments based on the severity of their condition – to classify the victims and direct their efforts where there is the best prospect of survival. Once the incident is under control the focus of ARFF attention moves to one of protecting the scene, eliminating any peripheral or evolving hazards and preserving the scene for investigation by the Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB), Air Accidents Investigation Branch (AAIB), or other authorities responsible for the investigation of aircraft accidents.

So, the three key factors that make all the difference between success and disaster in a survivable ARFF rescue attempt are training, the effectiveness of the specialised equipment, and the speed in which both of these elements are brought to bear on the emergency.

Specialised vehicles

Airport fires demand expensive, high-performance, specialised firefighting vehicles. They need to be fast, both in reaching the location of the incident and in extinguishing agent discharge rates. An aircraft accident could occur anywhere on or near the airport, so adequate water and other extinguishing agents need be carried onboard or be immediately available, and the vehicles need to be able to contend with rough terrain.

The most obvious difference between an ARFF vehicle and many municipal firefighting vehicles is the presence of vehicle-mounted water/foam cannons or monitors that are capable of delivering extinguishing agent over long distances. Today,



many incorporate twin-agent nozzles/injection systems to inject a stream of Purple-K dry chemical – particularly effective against Class B flammable liquid fires – into the AFFF foam stream to achieve a faster knock-down of the fire.

Many ARFF vehicles now feature the elevating/piercing nozzle High Reach Extendable Turret (HRET) and high-discharge bumper-mounted turret systems. These low-profile nozzles are showing to be particularly effective when attacking under-wing fires.

Typical of these vehicles is the Oshkosh Striker 3000 aircraft rescue and firefighting vehicle that has recently been chosen for Shanghai Hongqiao International Airport in China. It is a 6x6 all-wheel-drive axle configuration with independent suspension, triple-agent firefighting capabilities and advanced electronics for enhanced manoeuvrability, firefighting power and reliability. Other features include a 11,356-litre water capacity, 1590-litre foam capacity, roof turret and six under-truck nozzles.

Similar Strikers have also been delivered recently to the Pakistan Civil Aviation Authority (PCAA) to be stationed at civil airports throughout Pakistan.

The latest addition to the ARFF fleet in Sydney, Australia is the Morita MLK4-30 ladder vehicle, a high speed Aerial Specialist Vehicle (ASV) that provides the elevated capability required when dealing with large wide-body aircraft such as the A380 (see Issue 28 of International Fire Fighter for a more detailed article on Sydney's ARFF).

The vehicle is fitted with a 500-litre water tank for initial supply to a Morita ME 5 pump. This is a high-pressure and normal-pressure pump, capable of flows of up to 2850 litres a minute, although this vehicle is not equipped to discharge foam onto flammable liquid fires, unless foam is provided to the vehicle by supporting aviation vehicles.

Personal protection

Burning aviation fuel can reach temperatures as high as 1000°C, generating intense radiant heat, from which ARFF firefighters must be protected. This calls for the wearing of high-performance protective clothing and the extensive use of self-contained breathing apparatus to provide clean air, enabling them to work in the smoke or other super-heated gases environment.

According to recent figures to come out of the

USA, nearly 50 percent of firefighter fatalities are caused by heart attacks brought on by over exertion and heat stress. So, personal protection equipment (PPE) is not just about protecting firefighters from the immediate threat of fire; keeping the firefighter's body temperature at a safe level for as long as possible is equally important.

An example of what is currently being selected is Bristol's lightweight ErgoTech Action design incorporating a Pbi Gold outer layer with Goretex Airlock thermal and moisture barrier that was chosen by Airservices Australia.

ARFF Foam

Put bluntly, the survival of aircraft passengers and crew caught up in a fire is related directly to how fast the fire is extinguished. Burning aviation fuel under a crashed aircraft can burn through the fuselage in a couple of minutes.

While the "which foam" arguments continue unabated around the world, many subscribe to the view that AFFF foam is the best suited to fight flammable liquid fires and for ARFF applications – not everyone agrees though. It provides a blanket of foam that will reseal quickly when disturbed, allowing passengers and crew to escape through a foam-covered fuel spill and firefighters to enter the aircraft to rescue trapped casualties.

Some of those responsible for specifying ARFF vehicles are looking more closely at incorporating compressed air foam systems (CAFS), with advocates citing superior reach as an obvious benefit; the additional energy in the compressed air foam stream can propel the fire stream further. This increases the stand-off distance from the fire, which is a clear advantage, particularly with the latest generation of larger wingspan aircraft. CAFS produces a dense, consistent foam that adheres well to three dimensional fuels, and the bubble structure produced by compressed air foam is more durable and resists fuel pick up.

Food for thought

Aircraft crashes are, thankfully, rare, but they can happen anywhere – the majority that occur at airports do so on take-off or landing – and at any time and anywhere. Thankfully, that is a lesson that is top-of-mind of those responsible for the planning an execution of ARFF.



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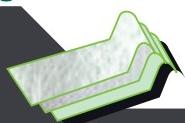
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**Graham Collins**

The Changing Face Of Municipal Vehicles

Today's municipal fire and rescue services have to contend with a growing number of challenges and, across the world, the requirements of one service can differ significantly for those of another.

There was undoubtedly a time when it was possible to describe what might be termed the "universal" municipal fire truck. However, those days are long gone. Today, each fire and rescue service has to weigh up the firefighting and rescue challenges it is likely to have to face, and have available firefighting vehicles that are as close as possible to a perfect match to confront them.

Several factors are likely to affect the vehicle specification including: the likely need for high-rise firefighting or rescue; the prospect of having to deal with hazardous materials; the possibility of having to provide support or back-up to industrial

firefighting crews protecting high-hazard environments, such as petrochemical plants; involvement in technical rescue operations; and the importance of being able to transport large amounts of water. Of course, many municipalities face all of these challenges and more, and have addressed the problem by opting for vehicle fleets that comprise a number of specialist trucks.

Indeed, such are the challenges that many municipal fire trucks could now be considered as highly mobile, multi-purpose firefighting toolboxes. They can be pumper, high-rise aerial ladder platform and turntable vehicles or specialist rescue



vehicles, or hybrids. These hybrids include: dual-purpose pump ladders. Other specialised vehicles include command units, high-volume pumping units and scientific support units.

Many are based on standard truck or lorry models with beefed-up suspension, brakes, tires and transmissions, although with the demanding requirements of many fire and rescue services, a significant number are now constructed on custom-built or modified chassis.

First attacker

An example of this type of "all-rounder" firefighting vehicle was recently supplied to the Kempen volunteer fire service in North Rhine Westphalia, Germany. In this case it was Rosenbauer's first L27-FA turntable ladder that incorporates the latest innovation from aerials specialist, Metz Aerials.

The unit is designed specifically as a first-attack vehicle for use in rural areas, where a combination of extended response times, personnel shortages and demanding firefighting tasks are commonplace. The vehicle has a height of around 3.3 metres, a maximum width of 2.5 metres and a total weight of 18 tonnes. The vehicle's short wheelbase of 4.2 metres provides a turning circle of less than 17 metres. The extinguishing technology comprises a Rosenbauer N25 rear-mounted pump, a quick-attack reel and a 900-litre water tank. The branch pipe/water monitor has an output of up to 2,000 litres-a-minute.

Its turntable ladder has a rescue height of 27 metres, a three-person/300kg cage, and offers considerable lateral reach. A powerful electrical unit incorporates a remote start device that powers extensive lighting, and the pump and the turntable ladder can be operated simultaneously.

Custom-built truck

Citing it as the largest single order in 18 years for its firefighting trucks, Pierce Manufacturing is set to deliver 104 custom-built trucks to Ghana's Ministry of Interior Service and the Ghana National Fire Service. The order includes 90 pumper tanker units, ten water tender vehicles and four aerial ladder vehicles. Shipment of the US\$ 31 million order will be completed over the coming 12 months.

The vehicles will replace existing units and will help the Ghana National Fire Service achieve its planned expansion from 136 to 202 fire stations across the country. The order includes: 60 Pierce Saber dual-purpose pumper tanker vehicles, each of which features a 7,571-litre water tank and a 3,785 lpm single-stage pump; 30 Saber dual-purpose pumper tanker vehicles, each outfitted with a 11,356-litre water tank; and ten Saber water tenders, each with an 11,356-litre water tank. The deal also includes four Pierce aerial ladder vehicles, each featuring a 38.1-metre aerial device, and 13 Jerr-Dan HDL 500 heavy-duty wrecker vehicles and four IMT service trucks.



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Command and Control

The New Zealand Fire Service has boosted its ability to command and control the country's hazardous chemical, biological, and radiological threats with the acquisition of 17 dual-role hazardous materials/command vehicles. Each vehicle is strategically positioned to enable it to respond within 20 minutes in major cities – typically those with associated ports or airports – and within 60 minutes across the remainder of the country, 90 percent of the time.

The communications and data technology on board each vehicle include a large touch-screen monitor, software to support emergency command and control decision making, capability for up to six workstations, satellite communication and a camera mounted on a 10.5-metre telescopic mast to allow those inside the command vehicle to get a bird's eye view of the incident ground. They also house disposable splash suits and hazardous materials detection, identification and monitoring equipment, and each vehicle carries a decontamination corridor that has two lanes to allow emergency service personnel or members of the public to be processed very quickly, with full privacy and using warm soapy water.

These decontamination corridors are a scaled-down version of the mass decontamination processes that were developed after the World Trade Centre terrorist attacks, and New Zealand is believed to be the first country in the world to use these mass decontamination principles for a business-as-usual emergency response.



Pumpers

Five Pierce Arrow XT pumpers are being supplied to the Bellevue Fire Department in Bellevue, Washington, USA and will be in service by the middle of the year. The department already has two Arrow XT pumpers in its existing fleet.

The new vehicles are equipped with a 1900-litre water tank, 6600 litres-a-minute water pump, a Husky 12 foam system designed specifically to handle structure fires, wildland fires, automobile and small Class B fires, internal ladder storage, roll-up compartment doors, and an LED light package that includes warning and step lights. The cab features seating for six firefighters, frontal impact and side roll protection systems, EMS cabinets, a tire pressure monitoring system, and a dual module vehicle data recorder.

Specialist units

A recent example of the highly-specialised vehicles used by municipal fire and rescue services is the three bulk foam unit appliances delivered last year to the London Fire and Rescue Service in the UK. Their commissioning is aimed at improving London's ability to fight major fires or spillages involving flammable liquids, in the aftermath of the Buncefield oil storage depot fire – the largest peacetime fire in Europe – and the city's terrorist attacks.

The vehicles enable firefighters to tackle emergencies such as aircraft crashes, chemical



spills or fires on large industrial sites, where large volumes of foam need be applied to bring the incident under control. The unit is based on a 26-tonne Mercedes Actros chassis with a rear mounted Moffett Mounty M9 forklift that is used to load and unload the foam concentrate. It features air conditioning and commercial satellite navigation system, and 8000 litres of low-expansion foam concentrate is carried in eight intermediate bulk containers and 1000 litres of high-expansion foam in a ninth container.

Two stillages on the bed of the vehicle provide stowage for ancillary equipment including foam generators and four monitors, two capable of producing 2000 litres-a-minute, and two producing 4500 litres-a-minute.

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Confined Space Rescues – Getting It Right

In the August/September edition of International Fire Fighter, Mark van der Feyst argued that failing to understand the environment was a major factor in why confined space rescues sometimes fail. Here he overviews the remaining aspects of confined space rescue that have to be right.

The acronym FAILURE is used to describe key shortcomings that can lead to there not being a positive outcome to any confined space rescue operation. The acronym stands for:

- F – Failure to understand the environment.
- A – Additional medical implications not considered, such as dust and crush syndrome.
- I – Inadequate preparation.
- L – Lack of team work and training.
- U – Underestimating the logistical needs.
- R – Rescue-versus-recovery.
- E – Equipment not mastered.

In the earlier article we looked at the letter "F" – the failure to understand the environment. In this edition, we will look at the remaining letters and see how each can contribute to the overall failure of a rescue operation.

Medical implications

The letter "A" represents a lack of consideration for any medical implications. The majority of confined space rescues involve a person who is overcome by a toxic environment or a lack of

oxygen within the confinement space. Medical factors alone, such as injury as a result of a fall, traumas, and cardiac arrest, are responsible for the carrying out of very few confined space rescue operations.

However, when such a rescue operation is initiated, medical factors still need to be considered and overcome. A person may be trapped within a confined space but have no injuries or medical condition. On the other hand, a person may be trapped within a confined space because of a medical injury.

Whether we have a fall or an injury of some kind, a quick size-up of the medical implications needs to be conducted. This can be done by speaking with the trapped individual. If they are able to respond, we can endeavour to determine what medical complications are present. If no communication can be established, observations of the environment will be the only way to determine this.

Certain confined spaces have mechanical equipment inside them that can trap or injure an



individual, so the medical implications need to be taken into account. Crush syndrome is a life threatening condition that needs to be considered whenever we have a body part trapped under or by a piece of machinery or even the structure itself. Crush syndrome is when the muscles are crushed with a certain amount or weight, resulting in the release of toxins – myoglobin, phosphorus and potassium – that rush into the blood stream once pressure on the affected area is released. These toxins can produce overall renal failure,

as well as cardiac arrhythmias, and without proper medical attention, may lead to the death of the trapped individual. One way to treat for severe crush syndrome is to amputate the affected body part before removing the casualty, severe though that may sound.

Another medical implication to be considered is dust. When there is a large quantity of fine dust present in the confined space, the individual will be suffocated. The critical action here is to get the individual removed as quickly as possible. This may well have to be a "grab and go" operation.

Preparation

The letter "I" refers to inadequate preparation for the worse to happen. Many rescuers will enter a confined space having given no prior thought about the actual rescue of the trapped individual. Gaining entry into a confined space is the easy part; getting the trapped individual out of the confined space if something goes wrong is the hard part. So, adequate preparation must be taken to ensure that the question of "How do we get the individual out" can be answered before the rescuer goes in.

Regulations are a great tool in preparing for a rescue, dictating what must be done, and what must be present on site, before entering a confined space. Forms can be created as a checklist to ensure that adequate preparation has been made, and a permit should always be filled out

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prior to entry. This permit should include a section detailing the rescue plan, clearly setting out what type of rescue will be carried out, who will be the rescuer, is the equipment needed on site, where is it located, and is it ready to be used, who is to be contacted for additional help, who will be the back-up rescuer, and what will be needed in terms of personal protection equipment.

Another important factor will be the skill level of the rescuer. The person assigned needs to be skilled in confined space rescue, as it is the hardest job when things go wrong. Many companies or rescue teams will assign the rescue position to anybody who wants to do it, and I know of many rescue teams that are staffed by recently graduated fire school college students with little confined space training or experience. This is because of the cost of having a standby rescue team; it is cheaper to have a graduate student than a professional rescuer. This inevitably results in inadequate preparation for rescue operations.

Teamwork

The letter "L" is for a lack of team work. During a confined space rescue incident, there needs to be one person one charge who will be your Incident Commander; the person who will make the final decisions on how to affect the rescue, which person will do what tasks, and oversee the whole operation from start to finish.

Rescue crews need to train together on a regular basis so they are familiar with each other's patterns, their thinking, their strengths and weaknesses, and finally to realise who will be in charge every time.

When emotions take over there is a tendency to ignore the Incident Commander and start to implement what is thought to be best and should be done. At this point, communications starts to break down, and mistakes start to occur, and mistakes made in ignorance can be deadly for both the rescuer and the person to be rescued. The same is true when team members are working together for the first time, as they will not know how the other person operates or thinks.

Rescue crews need to train together on a regular basis so they are familiar with each other's patterns, their thinking, their strengths and weaknesses, and finally to realise who will be in charge every time. Controlling one's emotions will also help in reversing the lack of teamwork. Rescuers who get excited very easily should not be the ones carrying out the rescue, as their contribution will be to add to the hysteria already going, making matters worse. Rescuers who are calm and collected, who have the ability to think and act under stressful situations, are the ones that should make up the team.

Understanding

The letter "U" is for understanding the logistical needs. It is wise to expect the worse and be prepared for it rather than being unprepared and then taken by surprise. Many times rescue crews are responding to a call unprepared for what they are going to face. One way to be prepared is by preplanning. If rescue crews visit, ahead of time, known confined spaces within their response district and pre-plan the response to that particular space, they will be much further ahead and better prepared.

Items to be considered when pre-planning include:

- Accessibility to the site.
- The type of space.
- Configuration hazards inside.
- Hazards on the outside and surrounding the space.
- Lock-out tag-out areas.
- The purpose of the space.
- Staging areas for equipment and resources.
- Frequency of confined space work.
- Average number of individuals entering the space.
- The level of training for on-site rescuers.
- Any special equipment needed for a rescue.

This list represents a generic approach to pre-planning a confined space operation. Once an initial visit is made, more questions may be raised requiring answers to come from on-site personnel.

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Another aspect to being prepared is having the equipment needed for the rescue to be on-site at the location of the confined space. Many times during a confined space entry, the rescue team will be on-site at the location, but the equipment is at a central location. If a fire crew is responding to a confined space rescue call and they do not have the proper equipment on their apparatus, they will need to get the equipment there by requesting additional units be sent having the proper equipment.

Rescue and Recovery

The letter "R" is for rescue-verses-recovery. Establishing the mode of operation at the onset of the effort is vital to its success. The Incident Commander needs to determine right away whether they are going to be conducting a rescue or a recovery. This determination will set the pace of the operation and it needs to be communicated

to everyone on site very clearly. A size-up of the situation will aid the Incident Commander in making this decision and rescuers need to realise that, sometimes, sadly we cannot save everyone. Would-be rescuers can soon become the victim, as they are overcome by toxic atmospheres found within the space.

This is where the team needs to have their emotions in check when they are confronted with the possibility of recovering a body versus rescuing a person. There was an incident a few years ago that involved an infant who fell into some fast-moving water. This small child was trapped in the low head dam for a while and no one could get to him. It was obvious that the child was dead, but with mounting pressure coming from the parents and bystanders, a police officer decided to rescue

Knowing how to use a piece of equipment is not all of the equation, you need to understand how and why it works and know its limitations because only with full understanding is it possible to master the piece of equipment.

the child. He was an experienced diver but in this incident, soon became the second victim. Even though this was not a confined space incident, the point is nevertheless valid, it was a recovery effort from the start, not a rescue, and that should have been maintained by all responding rescuers.

Equipment

The letter "E" is for equipment not mastered. Confined space rescue teams use lots of different pieces equipment to aid them with their operations, and this needs to be mastered by all those who are expected to use it. This occurs only through training and practicing with the equipment on a regular basis. The time to learn how to use a certain piece of equipment is on the training grounds and not at the confined space incident.

Knowing how to use a piece of equipment is not all of the equation, you need to understand how and why it works and know its limitations because only with full understanding is it possible to master the piece of equipment. Mastering the equipment also involves using it in the way it was designed to be used. Too many times, we as a fire service adapt a piece of equipment to fit our current need. However, equipment used in technical rescues is specific and designed for a standard method of operation; it is not designed to be adapted.

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Mark van der Feyst is an instructor at "Five Star" Training Services

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Vehicle Rescue – Extricate, Not Extract



Billy Leach Jr.

Developer and Senior
Presenter for Big Rig
Rescue

With vehicle technology constantly changing it is virtually impossible for responders to keep abreast of each and every change. Therefore, we should strive to create a simple procedure that is applicable to *all* vehicles. In doing so, we will create a safer rescue operating environment.

Step 1 – Secure the vehicle from movement

With the number of hybrid vehicles ever increasing, notwithstanding they look strikingly similar to their ordinary counterparts, responders may well endanger themselves by following a commonly taught procedure – the outer circle survey.

You arrive to find a driver slumped across the steering wheel appearing unconscious. Approach to the vehicle is made, attempting to make patient contact. The patient awakens after your contact, subsequently moving his or her foot from the brake and striking the accelerator. Suddenly the vehicle moves forward, striking a responder and injuring him. Unknowingly, the vehicle is a hybrid in the “sleep mode”, with the ability to travel at speeds near to 25 mph on almost silent electric power.

Generally speaking, Hybrids can be identified only after close inspection, and old habits are difficult to change. Typically responders have made rapid approaches to the patients without regard for potential vehicle movement. Consider placing two tire/wheel chocks near the initial response gear, serving as an obvious reminder to secure the vehicle.

Step 2 – Isolate the hazards

A majority of today's vehicles are equipped with six SRS airbags; quite possibly more. Two of the common SRS airbags installed are window curtain units that deploy downward from the roofline.

Responders typically approach the vehicle and lean into the window to begin their assessment. This places them in the direct deployment path of the window curtain SRS. Simply opening a door to begin assessment places them in the deployment

VEHICLE EXTRICATION



path of a window curtain SRS, door or seat mounted SRS airbag; actions that risk serious injury.

Immediately after arriving at the scene, responders must de-energise the vehicle's

electrical system by switching-off the vehicle, removing – and maintaining – the key a minimum of 15 metres away, disconnecting the battery, or

simply “double cutting” the battery cables. And remember, batteries may be found in any number of places within vehicles, so actively **look** for all of them.

Do not forget to disconnect or “double-cut” the 12V accessory cable, usually found connected to the positive battery terminal. If batteries are not accessible, remove all fuses. Capacitors are



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installed in the SRS circuit to provide an alternate source of energy to deploy the SRS. Generally, once the vehicle's electrical system is de-energised, these capacitors will begin decaying thus losing their stored electrical energy. De-energizing a vehicle's electrical system will isolate a hybrid's high voltage system.

Responders should cut the seatbelts promptly after gaining interior access. Simply the act of leaning into a vehicle to unbuckle a seatbelt places them into an SRS airbag deployment zone. Fully extend the seatbelt from its retracting mechanism and cut it.

As soon as possible, responders should check for a potential reverse-fed electrical source, such as items inserted into the cigarette lighter receptacle. If anything is found plugged into these receptacles, it should be removed immediately. Modern vehicles may have more than one cigarette lighter receptacle, perhaps in the rear of the vehicle.

Responders should remain aware of the '5-10-20" SRS deployment path during medical rescue operations.

Step 3 – Manage the scene

With ever-changing technology and increasing hazards, even seemingly minor incidents can escalate quickly. It is imperative to establish and provide incident management at every scene. The incident manager must make everyone aware of potential dangers that exist on scene. Likewise, every responder should inform the incident manager immediately of any hazards.

One particularly serious hazard that exists at any scene is that of approaching traffic. Each responder has a responsibility to protect himself. Every incident manager has the responsibility to protect responders from this hazard with effective parking and traffic control.

Step 4 – Protect everyone from fire

Likely, one of the foremost hazards at a collision scene is that of fire. Everyone at the scene must be protected.

A majority of today's vehicles are equipped with polyurethane plastic fuel tanks and pressurized fuel transport lines. The fuel transport lines are under constant pressure ranging from 15 psi to 95 psi. Should a transport line be ruptured, fuel is instantly sprayed onto sources of ignition resulting

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in a rapidly spreading fire. If the ensuing fire is not extinguished immediately, the plastic fuel tank will quickly melt and spill its contents.

Not all vehicles are powered from conventional fuels. This fact necessitates that responders ascertain the specific fuel being used and mitigate the hazard. This may include reducing vapour release by closing a valve or dissipating a vapour cloud. Responders must determine the vehicle's fuel source, and reduce its associated hazard.

Once a fire develops, the heat will envelop the compressed gas hood support struts greatly heating them. Likely they will dislodge, being propelled for great distances, with the very real potential to injure responders. Obviously patients must be protected while being treated and extricated. Responders should use a covering that is fire resistant, and offers excellent flash fire protection.

It is a fundamental task for responders to place a charged fire hose into position between the greatest fire hazard and responders. This fire hose must be capable of flowing 375 litres-a-minute and be staffed with by minimum of two firefighters that are fully protected with personal protection equipment, including self-contained breathing apparatus, with the mask in place.

Step 5 – Look before spreading or cutting anything

Many of today's vehicles are equipped with various SRS components that could become dangerous projectiles if physically damaged, heated, or severed. For example, compressed gas inflators for window

curtain SRS are pressurized to 3000 psi to 4000 psi. Possible locations for these inflators are the "A", "C", or "D" posts, lower dashboard area, the roofline above the rear window, and the roofline parallel the vehicle. SUV's may potentially have two compressed gas inflators on the same side, one for the normal curtain SRS airbag and one for third-row seating.

Pyrotechnic seatbelt pre-tensioners are commonplace in today's vehicles, usually found in the mid-to-low "B" post area. Responders should avoid cutting into these as well. *Without fail*, responders must perform the 'peek and pry' technique. In every circumstance responders must peel away the interior trim components to expose potential hazards to be avoided during spreading/cutting operations.

Step 6 – Extricate, not extract

In an effort to meet today's economic and safety conscious demands, manufacturers are creating smaller vehicles on the exterior, while maintaining larger interior compartments for passenger comfort. This places the patient nearer the "B" post area, likely beside it. We used to rotate the packaged patient in the seat and lowered them onto a long spine board. This worked well with vehicles having large doors, but is generally not the case today, creating the opportunity for greater spinal manipulation, causing additional injury.

We must remember at all times the basic mantra of extrication: *Remove the metal from the patient*. Axial spine alignment is imperative, thus responders should extricate, *not extract*.

Billy Leach will be presenting at "The Rescuer's Response to New Automotive Technology", a three-day training event sponsored by Central Carolina Community College, North Carolina from 11th to 13th March at the CCCC Emergency Services Training Centre. Additional information is available via email at ljphillips@cccc.edu

For further information, go to www.cccc.edu

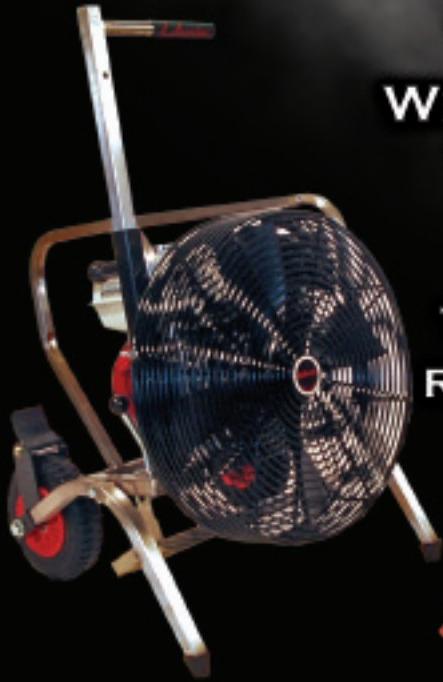


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Compressed Air Foam

– What's It All About?



Keith Klassen

The use of Class A compressed air foam as a tool for both fire suppression and exposure protection is steadily increasing. Fire departments are learning more about how and why to use compressed air foam (CAF) and finding that it is appropriate for numerous tactical applications.

In this article we will look at how foam is made, how compressed air foam systems (CAFS) work, some applications for CAFS, and what is new in Class A foam and CAFS.

The purpose for using Class A foam is to make water a more efficient fire extinguishing agent. Class A foam concentrate is simply a high grade synthetic detergent that, when added to water detergent, improves water's ability to fight fire in two ways. First and most importantly, it reduces the surface tension of the water allowing it to spread into a thin sheet. This provides more surface area, allowing the same quantity of water to absorb more heat. Second the detergent is attracted to carbon, thereby making the water carbon-loving. This characteristic makes the water attracted to Class A fuels, which are carbon based. The water will stay in contact with burning fuels longer providing more cooling; it will also be more easily absorbed into the fuels providing increased fuel moistures for protection of exposures.

In order to make finished foam bubbles, four components are required. These comprise the foam tetrahedron. They are water, foam concentrate, air and agitation.

When water and foam concentrate are mixed they form a foam solution. Class A foam concentrates are 1 percent concentrates, meaning that they will be mixed with water in percentages of 0.1 percent to 1.0 percent. The starting percentage for compressed foam systems is only 0.2 percent to 0.3 percent. This is due to the fact that CAFS is a more efficient way to produce finished foam bubbles. Air is then mixed with the foam solution to form the actual finished foam bubbles.

There must be agitation to force the mixing and form the bubbles, and the most efficient way to create agitation is a compressed air foam system. In the system, air under pressure is injected into the foam solution as it leaves the discharge of the apparatus. The agitation takes place in the fire hose and, as the mixture moves through the hose,

it tumbles and scrubs on the inside liner of the hose creating bubbles. CAFS is capable of producing very fine equally sized bubbles that provide the maximum amount of surface area for a given volume of water and therefore the maximum heat absorbing ability.

The simplest way to think of a compressed air foam system is as three separate pumps tied together. They are: a water pump, standard to any pumping fire apparatus; a foam pump typically called a proportioner; and an air pump commonly referred to as the air compressor. In order for these pumps to work properly together there must be check valves to keep the water, concentrate, and air in the proper place. For example, air in the water pump can cause cavitation and water can destroy an air compressor.

There must also be an auto balance system. Its job is to keep the air and water pressures balanced. This is important as both air and foam solutions are being added to the same hose line. If the pressures are not balanced, the product with the higher pressure will override and the mixture in the hose will be incorrect. In most systems the air is the last product injected and is added to each individual discharge separately. This is done to pro-

Air only can be provided for operating air tools or air bags, inflating tires, or charging hose lines with air. This is done by closing the discharge water valve and opening the air valve. Some systems also have an auxiliary air discharge on the pump panel.

vide full control over the foam being produced and to allow individual discharges to operate in different modes at the same time.

Most systems can operate in four modes. They are water only, foam solution, air only, or compressed air foam. Water can be flowed at any time through discharges not connected to the foam manifold, or through foam manifold discharges when the foam proportioner is turned off. Foam solution can be provided for a standard firefighting or aspirating nozzle through discharges plumbed off the foam manifold by opening the discharge water valve with the proportioner turned on. Air only can be provided for operating air tools or air bags, inflating tires, or charging hose lines with air. This is done by closing the discharge water valve and opening the air valve. Some systems also have an auxiliary air discharge on the pump panel.

CAFS applications

Compressed air foam is made by opening both the water and air discharge valves. The consistency of the foam can be adjusted simply by controlling the amount the water discharge is opened. The farther the valve is opened, the more foam solution will enter the line, displacing a portion of the air that is also entering the line. In general, there are two different consistencies of finished foam which are used. The first is wet foam, which is wet and sloppy with the consistency of melted ice cream. Its proportions are approximately 7.6 litres of water to 0.028 cubic metres of air. The total volume of liquid pumped will be determined by the size of the hose line being used.

Wet CAF is used in most applications, and is appropriate any time there is heat, flame or smoke showing. It can be used effectively for both fire attack and for mop-up and overhaul operations.

The second product is fluid foam, which has the consistency of shaving cream. Its proportions are completely opposite: about 3.8 litres of water to 0.08 cubic litres or 0.11 cubic litres of air. Because of the low water volume, this product is not appropriate for fire extinguishment. It is used specifically for protecting exposures, as it is capable of providing an insulating reflective blanket.

There are many reasons to used compressed air foam. The importance of each will vary depending on a particular fire department's organisation, staffing levels, equipment, and target hazards.

- **Firefighter safety:**

Because CAF is more efficient, it allows firefighters to extinguish the fire quicker, thereby being exposed to the situation for a shorter period of time. The high energy of a CAF stream provides a longer reach, allowing firefighters to operate farther away from the incident in a safer location.

- **Limited manpower:**

Compressed air foam does not replace manpower; people are still needed to perform fire ground operations. It does though allow the first arriving firefighters to do more in the first few minutes of the incident, which in turn positively affects the remainder of the incident and the total time at the fire scene.

- **Limited water supply:**

When water supply is limited the use of foam extends the capability of the water supply.

- **Wildland urban interface:**

Compressed air foam is very effective when used to protect homes and other property that are exposures in interface situations. Structures can be protected with a layer of foam and firefighters can move to a safe area before the fire arrives.

- **Improved fire investigation:**

Because foam is capable of quickly extinguishing the fire, more evidence is left for the investigator to examine. The lower total volume of water applied also leaves the evidence in place.

- **Environmental impacts:**

Lower volumes of water used also means that less fire debris is washed out into the environment. The use of foam to create fire lines in wildland scenarios can be more ecologically friendly, as opposed to creating the line with heavy equipment.

The applications for compressed air foam vary widely. In the wildland arena, they include direct fire attack, creation of indirect fire lines, mop-up and overhaul and exposure protection. In the wildland urban interface, foam is used extensively for both fire attack and structure protection. Compressed air foam works exceptionally well



in extinguishing and overhauling vehicle fires. In structural firefighting CAF is highly effective when used both for exterior and interior attacks as well as for fire overhaul.

Latest developments

Recent technical developments in compressed air foam systems have concentrated on making the systems more accurate and firefighter friendly. The use of an auto tank fill device manages the water

for example, are now capable of sensing not only water flow but also water temperature and conductivity. These increased sensing capabilities make the system more accurate and help mitigate variables such as water and foam concentrate quality, providing a more consistent foam product. Elkhart Brass and Waterous have also developed the Intelligent CAFS Selector (ICS) valve that is used to control the discharge water and air valves on a CAFS. The ICS provides three

Foam refill pumps allow concentrate to be pumped into the apparatus tank from ground level, eliminating the need for firefighters to carry foam concentrate buckets to the top of the apparatus.

tank level automatically when the apparatus is hooked to a water supply and makes it easier for the operator of the CAFS to maintain consistent operations. Foam refill pumps allow concentrate to be pumped into the apparatus tank from ground level, eliminating the need for firefighters to carry foam concentrate buckets to the top of the apparatus. This reduces the slip-and-fall hazard for personnel.

The foam proportioning systems from Waterous,

preset positions, but still allows for full operator control to make adjustments to the foam as needed. This valve allows the system to be put into operation quickly, accurately, and with repeatability.

Over the years compressed air foam systems have developed from rudimentary machines into sophisticated firefighting systems. This, combined with the increased knowledge of their use and capability, will make them an ever expanding tool in today's fire service.

Keith Klassen is Waterous
CAFS Instructional Program
Manager

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Haiti Revisited

It is a year since the United Kingdom International Search and Rescue (UK-ISAR) team returned from the devastating earthquake in Haiti, and the trauma for the Haitian people continues, unseen by a less caring world, and of less interest to the media.

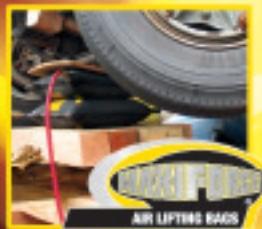
Many thousands of Haitians still live in makeshift accommodation and many more survive under canvas in areas not as badly devastated by the earthquake, but nevertheless prone to the flooding and bad weather that typifies the region at this time of the year, and a government that still struggles to find the means to make the difference to ordinary people's lives. Of course those that knew of Haiti before the devastation will argue that Haiti was struggling before, so nothing is new. For the UK-ISAR team the scenes are just as vivid as if it were yesterday.

We are constantly reminded that more than 345,000 people perished in those devastating few seconds of the earthquake, more than 45,000 people are still unaccounted for and more than half a million people are displaced. 1.5 million people were left homeless. This is one of the world's worst ever natural disasters and the magnitude, the horror and the suffering still astound me.

The priority for us on returning was, of course, to get back together with our families and friends and to try to make some order out of the bombardment to our senses. We very much relied on our families and friends, as well as the more formal structures in our various fire and rescue services that provide occupational support for traumatic incidents. Naturally though, we had the continued media interest and a reception with the Prime Minister's wife, a reception by the Fire Minister alongside the "team of the year" award at the Firefighters Charity awards where the standing ovation at the award to the team showed the support and admiration for the team's achievements, and made a few eyes water.

Each of the teams has hosted local events and been invited to talk to many different interested institutions. While these have slowed down, I still have events planned for 2011 – more than 12 months on from the earthquake.

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Lessons learnt

After these types of events, the post incident reviews are important so the team can continue to develop. While we are an integral part of the UN response mechanism, we have already held three debriefs all aimed at identifying the strengths of the international response and co-ordination of efforts, as well as those areas that did not work quite so well.

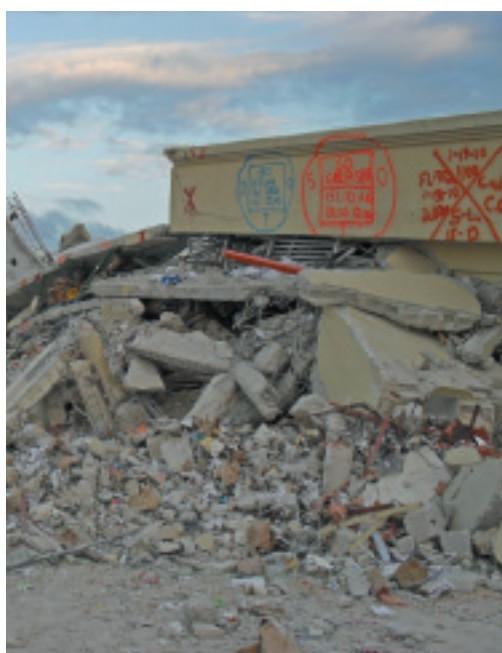
Our own internal lessons-learned log following debriefs within the team and with the Department for International Development (DfID) show that there are areas still ripe for improvement. It was

**This is one of the world's worst
ever natural disasters and the
magnitude, the horror and the
suffering still astound me.**

important that we held this debrief with DfID as quickly as we could, mindful of the then planned election in the UK and the new government. For those of us who believe the UK has a leading part to play on the international stage, we are pleased that the new UK coalition government has placed international development as one of its priority areas. It has made the lessons learned an important feature in assisting the UK to play its full part in disaster response, with the UK-ISAR confirmed as the principal agent in earthquake and transitional humanitarian response.



This has allowed the UK to play an active part in the international debrief and the Office for the Coordination of Humanitarian Affairs (OCHA), through the International Search and Rescue Advisory Group (INSARAG), has been looking critically at the international response and is mindful that many of the teams responding did not do so in the format under which they were classified, but instead turned out to be much smaller teams.



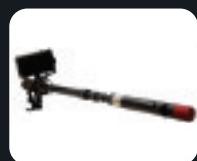
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Coordinated effort

There is also a need to give a greater role in co-ordinating responses through the larger "heavy" teams, such as the UK, to ensure that there is a clearer focus and better use of the opportunities

that classified teams offer. For example, the UK-ISAR team left the "base of operations" on two occasions; first time with the Icelandic medium team to go to Leogane, and then three days after returning, went with Polish medical team and one

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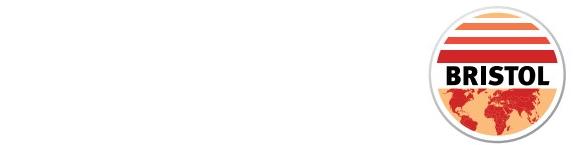
In both cases the UK had the organisation and capacity to move quickly and set up a forward receptions centre, as well as operate search and rescue teams. With the host country responsible for fuel and transport as part of its responsibilities, the greater the number of teams that responded, the more problems that were created. More than 50 teams responded to Haiti. However, only 12 were classified teams and of the remainder, few had the kind of capabilities needed to fully meet the INSARAG requirements. Many of these were well meaning but woefully unprepared teams, sometimes as small as four people.

Much of the UK's early energy was involved in getting transport and security arranged for these smaller teams, creating dilemmas as the UN was not able readily to coral these smaller teams alongside the classified teams.

Creating resilience

The first INSARAG world meeting held in Kobe, Japan last September considered this issue and reconfirmed the key role that classified teams play. The meeting ended with a "Hyogo Declaration" that forms part of a mandate to the UN. This will, hopefully, lead to a new UN resolution supporting the continued response to disasters by INSARAG classified teams, with these prioritised by affected countries.

This is not elitism, but a strong endorsement of the value that the INSARAG system brings. It does not mean the end of smaller teams, but instead that they strive to meet the well practiced and well rehearsed INSARAG guidelines. These guidelines are now expanded to assist countries develop their own internal search and rescue capabilities; a really tangible and successful outcome. The UK will continue to provide support to those who



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want to develop their capabilities and recently has assisted in the UAE, Kosova and, latterly, Palestine.

The events, as they unfolded in Port-au-Prince in Haiti, show the importance of developing community resilience. The fact that, today, so many still suffer with inadequate shelter and basic human requirements, and the fact that so much of the basic infrastructure still remains inadequate, shows the importance of recognising the likely events and the importance of preparing the community. All such events show us that reliance solely on local emergency responders is not sufficient, and that self help is the key to both survival and speedy recovery. It is worth remembering that seismologists visited Haiti three years before the earthquake and predicted a major seismic event.

Re-evaluated relationships

Internally, UK-ISAR has reviewed its response structures, has re-evaluated its relationship and response with DfID, and is in the process of redefining its memorandum of understanding with each fire and rescue service that contributes to UK-ISAR.

The issues of quarantine for the returning dogs has caused, for some, a minor irritation that has been blown out of all proportion by a few, but now offers a opportunity to ensure the UK's own home response needs are not compromised by the overseas needs. The team continues to have the support of CLG that approves of the use of the urban search and rescue reserve equipment as part of the UK-ISAR international response.

There is no doubt that the capability the UK possesses in its overseas response is enhanced by its home USAR operations, and there is a strong relationship between the two, with absolute clarity



that USAR is for home use only and not designed to go abroad.

That works well for the specialist collapsed structure and earthquake scenarios but, perhaps in the minds of some, not so for other areas that fall within the "New Dimensions" umbrella; although whether we would see high-volume pumping assets taken beyond any land access in Europe, at a speed that might make a difference, remains to be seen. UK-ISAR continues to develop closer working with ambulance Hazardous Area Response Teams (HART) that are developing a range of complementary skills and perhaps a more unified UK-ISAR/HART with a field hospital capability may be the future.

Continued support

There is no doubt that the UK plays a significant part on the UN INSARAG stage, and is a key player with the capability, speed of response and professionalism that remains the envy of many who look at the UK as being the beacon and benchmark for others to strive to emulate. We should value that position and ensure that there is a strong desire within the UK fire and rescue service to maintain this position.

Haiti is not forgotten, nor is the ongoing plight of its people. Members of the UK-ISAR team are planning to visit Haiti in the Spring to assist develop the fire and rescue service and improve its ability to deal with the every-day emergencies and hopefully take them towards improving their impact on community resilience in the future. **IFF**

Mike Thomas is the Chief Fire Officers Association's Lead UK-ISAR and recently retired as Chief Fire Officer of Lincolnshire Fire and Rescue Service

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Henry Barton, centre



By Alison Aprhys

Victoria CFA

Against The Elements

– CFA's Wildfire Firefighter Training

In Australia, Victoria's Country Fire Authority (CFA) operates in one of the most fire-prone areas in the world. To meet that challenge, CFA considers pre-summer fire training a critical element for its operational firefighter education and skills maintenance.

While CFA members attend around 35,000 incidents each year, the first qualification they need in order to become operational is wildfire training. For many firefighters, wildfires will make up the majority of the incidents they attend. No matter their level of experience, members undergo regular refresher training to bring them up-to-date with using new equipment, techniques and processes. The training spans different levels from Minimum Skills right through to the expertise required to become a strike team leader.

It is a clear, cold spring evening and at fire stations all around Victoria, firefighters are gathered outside by their tankers preparing to practise drafting, hose-laying, pumping, firefighting and survival techniques. Despite summer being just around the corner, a cold southerly is blowing. In anticipation of a soaking, most are wearing a warm jumper under their yellow wildfire gear. Some members are decked out in brand-new gear, whereas a little wear and tear on others proclaims that this is not their first fire season.

No matter if they are a new recruit or a veteran of Ash Wednesday or the 2009 Victorian Fires, everyone takes their training very seriously. They come from all backgrounds – school teachers, plumbers, retirees, shopkeepers, university

students, nurses, stay-at-home parents, accountants, mechanics and farmers to name just a few. But they are all united by a desire to help their communities. They give up anything from a few hours a week to attend training and call-outs to using up their annual leave to join a strike team when needed.

So there is no mucking around as they go through their training, which includes bowling and connecting hoses to couplings, operating pumps and applying water from a variety of branches.

Inside the station, another group of members is watching a video and discussing attack techniques depending on various topographies and weather conditions. More experienced members pass on sage advice to new recruits who listen soberly. Another group is outside perfecting their 'step-up technique' with the rake hoe, where firefighters use dirt to blackout rather than water. After they pack the equipment away and have a cuppa there is time for a joke and a catch-up. Everyone understands that effective training and planning can mean the difference between success and tragedy.

While learning how to fight fires is an integral part of training, CFA insists that firefighter safety is its number-one priority. "The safety of our people is of the highest importance to CFA," states Greg Baxendale, Manager Training & Development,

TRAINING

Katrina Knowles



Districts 4 & 5, Barwon South West Region. "CFA's Safety First culture is embedded in the organisation."

Greg explains that this means new volunteer firefighters need to undertake the right training before qualifying with Minimum Skills and being able to attend fires. He says that once this basic training has been completed there are dozens of advanced courses on offer.

Plus, CFA's more experienced members may also choose to undertake regular refreshers to ensure they are conversant with new equipment and processes. "Wildfire training involves more than 'squirting the wet stuff on the red stuff,'" Greg says. "Members may also need to update their qualification or master other skills in such diverse areas as drafting, truck driving, first-aid, crew leading and management, fire investigation, communications and mapping. They are also able to progress into very specialised Incident Management roles with the appropriate experience."

Greg stresses that members need to be prepared to continue their learning throughout their CFA membership. "Let us not forget that education of any sort is simply the foundation of a person's life-long learning, it is not the end of it," he says. "For example, when volunteers are first qualified in a particular competency, their proficiency level is adequate to be deemed competent. It is only through practice, that volunteers truly become proficient and are then able to operate at the level that the community expects them to operate at."

Greg says that by offering high-quality training and education to CFA members, its firefighters and support people have the opportunity to do their best when the situation demands.

Warrnambool Fire Brigade (WFB) Operations Officer Henry Barton says ongoing wildfire training helps the brigade's 35 career and volunteer firefighters gain confidence in their own skills as well as those of their colleagues. He says the career firefighters enjoy the time they dedicate

from October to December providing wildfire skills maintenance with the volunteers. The training is conducted over four nights and often involves volunteers from neighbouring brigades.

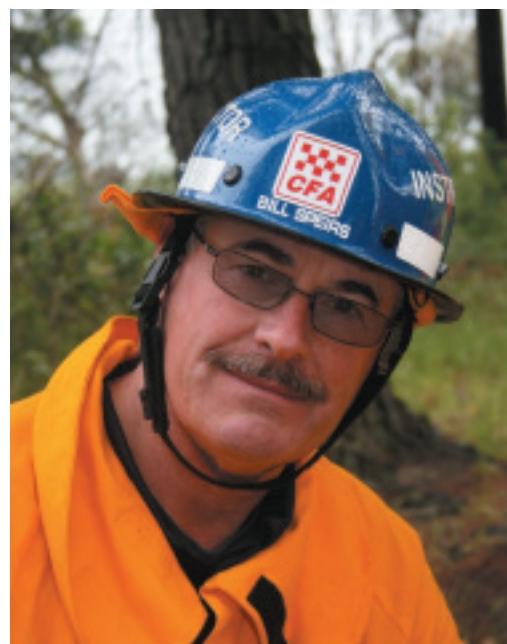
"This training is a good opportunity for our members to not only refresh their training but to also interact with each other in action and gain confidence in the abilities of their colleagues," he says. Henry says that the WFB has been providing the training for around a decade. "The confidence that volunteers and staff gain in each others' capabilities is excellent," he says.

Henry says that all brigades in District 5 are participating in wildfire training as a part of their Section 29 compliance, which reviews brigade viability and ability, from people through to the processes and equipment. "This means that when members go on a strike team or attend an incident with their colleagues from other District 5 brigades, they know that everyone has undertaken wildfire skills maintenance and they can have confidence in their fellow members," he says.

Based in Hamilton in Victoria's south-west, CFA Senior Wildfire Instructor Bill Speirs and his colleagues endeavour to create, run and deliver exceptional firefighter education and training. A highly experienced fire investigator and firefighter, Bill joined CFA as a volunteer in 1962 and is currently a member of the Nelson Fire Brigade, situated on the rugged Victorian coast near the South Australian border.

According to Bill, all members, career or volunteer, receive comprehensive training. "We teach our members right through from Minimum Skills to fireground leadership roles," he says. "This includes crew leader, strike team leader and sector commander courses and the incident management roles including planning and logistics."

Bill explains that one of the biggest training challenges is that the volunteers undertaking these courses are doing so on top of their work, family and community commitments. "We aim to make the training interesting, relevant and enjoyable because if we do not hold their attention after



Bill Speirs



Boyd Falconer

their day's work, we have lost them," he says. "We strive to have participants involved rather than sitting through a lecture process."

Flexibility is also a key strategy so courses are usually run outside office hours and scheduled to suit particular groups. "Some volunteers are happy to give a weekend or specific night so we work around this," he says. "With dairy farmers we might run shorter day courses so they can fit in their milking."

Bill says that it is important to balance out the classroom learning with the practical. "We intersperse the theory with hands-on scenarios so we select locations that reflect the topography and weather conditions of the topic and this seems to work really well," he says.

and that was really good practice," she says.

Over at Gorae West Rural Fire Brigade (GWRFB), Lieutenant Boyd Falconer, a 17-year member, reckons you can always learn something new. A qualified crew leader and strike team leader, Boyd believes intense training is essential. "This provides us with the opportunity to hone our skills, reacquaint ourselves and other less active members with equipment and procedures and along with the various community fire ready programs provides us with an opportunity for the recruitment of new members."

He says that during 2010 GWRFB has expanded its current combined district, group and brigade training to incorporate special sessions with two neighbouring brigades with which they often turn

Victoria CFA has more than 59,000 volunteer members plus over 550 career firefighters and is responsible for protecting approximately 3.3 million people and 1 million dwellings.

One firefighter who has attended Bill's wildfire training is volunteer Katrina Knowles of the Milltown Fire Brigade. Like her colleagues, she is keen to keep her skills up-to-date so that when she dons her turnout gear she is fully prepared. Although Katrina joined CFA in 2007, she has rapidly undertaken a number of training courses including crew leader.

"I think that the CFA training is very professional, the facilitators make the effort to know and understand everyone's background and skills so their training can be delivered in such a way that everyone benefits," she says. In regards to preparing for bushfires, Katrina adds that participating in Department of Sustainability and Environment (DSE) back-burning has also been very valuable. "When DSE did the burn-offs our brigade assisted

out. "This gives us the opportunity for more attendees, greater communication levels and better understanding of each others' crews and equipment as we frequently turn out to small incidents together," he says. "We are quite often the only brigades on scene; we have similar types of areas and attend very similar types of incidents."

Although he is now assisting newer members with training, Boyd says that over the years he has found that the support, variety, opportunity and the encouraging atmosphere that accompanies CFA training are some of main reasons he continues. "The opportunity to put into practice new skills learnt with the support and encouragement of a senior CFA member is something I find to be a very positive aspect of the training system," he says.

Alison Aprhys is a freelance journalist who has worked in-house at CFA and is a volunteer firefighter.

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Jason Rigenbach

Akron Brass

Nozzles - The Driving Force Of Firefighting

Firefighting continues to evolve and progress, constantly endeavouring to become more efficient and, more importantly, safer. Hand line nozzle technology is one aspect of firefighting where this has been particularly noticeable.

The first nozzle was, in reality, not a nozzle at all; buckets and manpower was, for centuries, just about the only method of water delivery. In the early 19th century, with the arrival of hand-pumps, heavy brass or copper smooth bore nozzles started to be used. This hand-pump technology was confined to the history books later in the 1800s, following the introduction of steam-powered pumbers.

This increase in available "pressure" at the line of attack paved the way for advances in nozzle technology. The solid-bore nozzle paved the way to the fog-pattern nozzle that offers more protection to the firefighter. That being said, the solid bore nozzle is still in use today, and is defined as a solid stream nozzle, with an unobstructed waterway that is available in a variety of sizes. The biggest advantage of smooth bore nozzles is their superior flow rate, penetration and reach. These nozzles are also less costly, easier to operate, and easier to maintain than other nozzle designs. The disadvantages of the solid bore nozzle are that there is no flow control, reduced flexibility, no spray pattern, and minimal cooling.

The fog style nozzle has a few manifestations in today's fire and rescue service. It started as a single litreage nozzle that offered a straight stream, as well as the protective fog pattern. Like a smooth bore nozzle, this nozzle has a fixed orifice; it is relatively easy to operate, and is the lowest cost combination nozzle. The downside is that there is minimal flow control, higher cost, and greater steam potential than the solid bore.

Adjustable litreage nozzles came next. These "selectable flow" nozzles give the firefighter complete flow and pressure control at the nozzle by adjusting the orifice size. The negatives are higher cost and more training is required because of the greater number of moving parts and a more complicated maintenance requirement.

The automatic nozzle was introduced and designed to take away the flow control from the nozzle operator. This nozzle "automatically" maintains a constant pressure through internal mechanisms and is sometimes referred to as a "constant pressure" or a "floating flow" nozzle. While this nozzle maintains a good stream appearance over a wide range of flows, it requires more

SaberJet



pump training and restricts the flow in low pressure situations, making it less effective.

The smooth bore, single litreage, adjustable litreage, and automatic nozzles have served the fire service for many years, and there are strengths and weaknesses associated with each. Weighing the performance, training requirements, and the complexity of each nozzle against the particular department's firefighting strategies helps to determine the best nozzle for them.

Latest developments

The development of nozzle technology did not stop with these nozzles. For example, Akron Brass has a truly multi-purpose nozzle that combines the Saberjet penetration characteristics of a solid bore tip with the protective advantages of the fog pattern. This nozzle is available in both a single shut-off and dual shut-off versions. This particular nozzle technology uses a true smooth bore to deliver high flow, excellent reach and penetration and lower reaction force. Also, simply by adjusting the bale handle (single shutoff) it can be switched to fog mode with a stream range that spans from narrow to wide fog.

The dual model, which utilises separate shut-offs, provides the option to flow both the solid bore and fog stream at the same time. The dual shut-off version can also provide straight stream through wide fog patterns using the twist shut-off pattern sleeve. Both models provide the ability to switch between solid bore and fog without shutting down. This flexibility minimises training to one nozzle for most firefighting situations.

At the same time, there has been an evident need in the industry for specialty nozzles to be used in specific firefighting situations; nozzle that are engineered for each precise requirement.

Specialty nozzles

One use for a specialty nozzle is when there is a fire that cannot be reached using a traditional

hand-line nozzle. It could be the fire is inside a mobile home or behind a concrete wall where there is a need for a piercing applicator nozzle. A firefighter can use a sledge hammer to drive the piercing applicator through concrete block, automotive sheet metal, motor home or aircraft fuselage. It is designed to get water or foam into hidden trouble spots, and some of these nozzles are equipped with a driving button and a point made of hardened steel with impinging jets for a dense fog pattern. It is useful for these applicators to be compatible with Class A and Class B foams. There are numerous sizes of applicators available, with the option of adding a one-metre fiberglass extension for even greater reach.

Another application for a nozzle that is designed for insertion into areas that are too dangerous for firefighting personnel to reach is when there is a need for high flow with plenty of coverage. This occurs when a firefighter is able to cut through a floor and drop a nozzle to the area below, or reach up through a ceiling into an attic.

In the marketplace today, there is a unique 90 degree applicator with an integral shut-off valve and a rotating cellar nozzle with foldable/retractable legs. This unit is designed to free up the firefighter when confronted with situations requiring an overhead attack. Once this new applicator is in place the firefighter is available to perform other duties. These aluminium applicators are light weight and deliver large amounts of water of up to 1900 litres-a-minute at very low pressures of 3.35bar, covering a diameter of eight metres with its spray pattern.

This particular design of nozzle is great for keeping the firefighter as far away as possible from the most dangerous area of the fire. It can be used at the end of an aerial device; dropped through a window and then punched through a floor.

TurboJet



Chemicals and gels

As the fire service has advanced, it has moved beyond using only water to extinguish a fire. Today, it is not uncommon to use chemicals and foam to fight a fire. Fire departments use chemicals to improve the effectiveness of water, thereby creating greater knockdown efficiency and increased firefighter safety. The additives in this water are sold in high-concentration and require mixing to form a solution at percentages dictated by the application, or as recommended by the manufacturer. Hundreds of these concentrates are available today, but the majority fall into four basic categories: Class A foam; Class B foam; emulsifiers; and gels.

Recent events in many parts of the world, including California and Australia, have generated considerable discussion about the ever increasing occurrence of wildfires and bushfires. One of the unique characteristics of this type of forest fire is that, at times, it can be very fast moving. As a result, fire prevention gels have come onto the market that are designed to coat a structure, and allow that structure to withstand intense heat for a short period of time, allowing the fire to pass through and not destroy the structure.

There are specialty nozzles, constructed out of both aluminium and plastic, designed to efficiently mix and apply this gel in combination with water. A common size is a 25mm self-educting gel nozzle, which is designed particularly for the wildland/forestry applications. One of the most challenging aspects of using this gel with nozzles is that it is extremely difficult to clean the nozzle after use.

This has been overcome with the recent introduction of a nozzle that has a back-flush option that enables the effortless cleaning of gel from the nozzle after use. The nozzle also has a built-in adjustable orifice in the eductor to allow infinite

adjustment between "off" and 6 percent concentration for maximum effectiveness. In addition to these features, the nozzle has a built-in check valve to prevent water from entering the gel container. It comes as standard with a 305mm tube and an optional 1.5-metre pick-up hose that is available with 19-litre buckets.

Foam application

Foam equipment offers a considerable number of options for both municipal and industrial firefighting. Municipal eductors are designed to provide precise flow percentages at various settings, and industrial eductors are intended for use in some of the most extreme environments.

Just about any type of hand line nozzle can be used to produce Class A and Class B foams with expansion ratios of 4 or 5:1. Clamp-on foam tubes that are specially designed can be added, and these same nozzles can now produce air-aspirated foams with expansion ratios ranging from 12:1 to 50:1. This will effectively smother fires and contain flammable vapours with a thicker layer of foam. There are numerous flow rates available up to 950 litres-a-minute.

There are master stream foam nozzles available for higher volume applications with flow rates up to 7600 Litres-a-minute, or more of an air-aspirated expanded foam. They can be specified for use with fixed or portable monitors as well as with remote controlled roof-mounted turrets.

So, the fire service has evolved from carrying buckets by hand to being able to calculate the exact amount of water needed to put out a fire. There have been many upgrades in the equipment used to fight these fires, and there will no doubt continue to be further advances that make the firefighting more efficient and safer.

Jason Rigenbach is
Product Manager at Akron
Brass

For further information, go to
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Fighting The Offsh

*Photograph courtesy of
Chad Teer, Coquitlam,
Canada*



Graham Collins



Fighting a fire offshore is a truly nightmare scenario, as the 2010 fire on the BP platform in the Gulf of Mexico demonstrated so graphically.

Fire suppression systems on oil platforms have a lot with which to contend. They must withstand a truly hostile and highly corrosive environment; they must be easy to maintain; and they must respond quickly to fires that develop rapidly, typically with high heat-release rates. It is also essential that these systems offer unsurpassed reliability, as help from elsewhere is unlikely to arrive in anything like the time that will ensure that the blaze will not develop into a life and asset threatening inferno. The reality of the situation is that, for all practical purposes, merely containing a fire until help arrives is not an option, so the effectiveness of firefighting efforts are entirely down to the rig's workforce and having the most appropriate systems in place.

Advances in fire safety technology, coupled with an understanding of the importance of regularly conducted risk assessments and the implementation of soundly thought out fire safety strategies, has been noticeable in the past few years. The result is that tried-and-tested solutions are now available that safeguard both the platform

operator's high-value assets and the lives of those who work in what by any definition is a tough and potentially dangerous environment.

However, an offshore platform fire can take many forms: fuel-controlled pool fires are characterised by a rapid rise in temperature, up to 1300°C; continuous-release jet or spray fires have high heat fluxes that can quickly lead to structural failure; flash fires and fireballs produce thermal radiation and can quickly escalate and generate secondary fires. So, offshore fire safety should never be seen as just a matter of having available the best firefighting agents and delivery systems – frequent and repeated training is absolutely essential; so too is regular professional maintenance of every piece of fire safety equipment.

That being said, no amount of personnel preparedness will make up for the installation of firefighting installations that are simply not up to the task. These must be systems that can be relied upon to swiftly extinguish fires and reduce the likelihood of escalation; and where appropriate,

ore challenge

reduce the fire's heat and limit heat radiation and smoke movement.

The major risk offshore is that of an uncontrolled hydrocarbon fire, as often as not resulting in spillage into the surrounding water and, from the firefighting point of view, the challenges can be divided into two distinct areas. These are the "topside" or production areas that include the off-loading, drilling and platform wellhead areas, and the platform helicopter pad, and the platform's control facilities.

Water deluge systems and watermist systems are frequently used to protect certain areas of the production facilities, thanks to the limitless availability of seawater. However, fixed foam firefighting technology is also popular as it is seen to be a fast and effective means of suppressing a hydrocarbon fire in the wind and weather conditions often experienced at sea. Total flooding gaseous suppression systems are frequently used to protect command, control and communications facilities on oil platforms, while dedicated in-cabinet protection is becoming established for the protection of enclosed pieces of mission-critical equipment.

Watermist systems

Watermist systems are efficient and environmentally acceptable, particularly for the protection of accommodation and machinery areas on offshore platforms.

The discharge of the watermist results in an immediate drop in temperature of the fire and protects the adjacent area from radiant heat. The smoke scrubbing effect of these systems, helps to bind the smoke particles and wash the water-soluble gases. This is claimed to reduce considerably the emissions compared to deluge and gas extinguishing systems.

Firefighting foam

AFFF [Aqueous Film Forming Foams] foams have been used on oil rigs and production platforms for many years. They meet the industry's quality standards; can be delivered using a wide selection of equipment, plus they have an acceptable shelf life. Their effectiveness though is very much down to the performance of the foam delivery system.

There are a number of foam delivery systems that are specifically designed for fighting oil platform fires, including special helideck firefighting system that can be adapted to suit the dimensions and layout of the platform's helicopter landing deck.

The major components of a typical offshore platform foam firefighting installation are: a displacement pressure proportioner with a foam concentrate tank, often better known as a bladder tank; and two foam monitors, one placed on either side of the helideck. While the bladder tank has the benefit of combining a foam concentrate storage facility with a proportioning device, its reliability is given a major boost by its not requiring any external power sources, and its few moving parts.

To operate the system all that is required is water under pressure, and the measuring orifice can be placed at any convenient location between the bladder tank and the monitors. In many cases this is a 600-litre bladder tank/automatic proportioner and a pair of monitors, each with a typical delivery rate of around 2,500 litres a minute.

Total flooding suppression

Fixed total-flooding gaseous systems are used extensively to protect offshore platform control rooms and communications centres using a variety of suppression agents but, typically FM-200 or Novec 1230 Fire Suppression Fluid.

Significantly, these agents can be used with absolute confidence to suppress fires involving vital electronic equipment. Novec 1230 for example has a negligible impact on the environment and an insignificant global warming potential, substantially lower than any of the halocarbon agents that are acceptable for use in occupied spaces.

While safety and asset protection are the offshore industry's primary concerns, their current marketing campaigns clearly show that many are aiming to achieving a more environmentally-responsible image and are investing heavily in environmental initiatives.

In some instances, this materialised as a concern for the environmental performance of the products and systems used on offshore platforms, and has led to a growing interest in the use of inert gas fire suppression systems. These are non-toxic, non-corrosive and odour-free, zero ozone depleting agents and with zero global warming potential. The result is an increase in the use of inert gas systems to protect enclosed offshore facilities.

Inert systems use a mixture of naturally occurring gases and so represent truly sustainable "clean" fire suppression technology. They are also fast acting, electrically non-conductive and have no breakdown products or residue to damage to sensitive equipment. There is a downside though that is an important issue for many platform operators and that is that inert systems require much more storage space than either an FM-200 system or a Novec 1230 installation.

In-cabinet protection

Increasingly, mission critical assets that are housed in cabinets are being given dedicated protection in the form of tube-based detection and suppression, often in combination with full-room total flooding for the open areas. Such systems ensure that, if a fire breaks out in that enclosed environment, it will be detected and suppressed right where it starts. Significantly, there will be no need for the remainder of the control centre's total flooding system to be discharged. If the fire breaks out in the main area, it will be suppressed by a total flooding system, without the in-cabinet systems being activated. Both scenarios can result in saving the unnecessary discharge of suppression agent.

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Graham Collins

Firefighting's Big Guns

Fire monitors or fire cannons are the "big guns" when it comes to foam or water delivery; a real "front line" firefighting resource, particularly in volatile high-hazard environments.

There are two types of fire monitor. The fixed monitor is, as the name implies, a static monitor that is attached permanently to pipework and is positioned to stand ever-vigilant over a clearly defined fire risk. In most cases, this is a high-hazard Class B flammable liquid fire risk involving petrol, diesel, solvents, lubricants and spirits. However, fixed monitors are also used in aviation hangars, on helicopter landing pads, on fireboats – essentially, floating fire engines – and on high-performance, fast-response vehicles used for airport rescue and firefighting (ARFF).

The second type is the mobile monitor that is used on the same Class B fires, but is often trailer-mounted for fast deployment around the site. Obviously they require a water supply, which is provided by either a hose connection to a hydrant or a portable pump.

So, which is the most appropriate for a particular application?

The benefit of a fixed monitor is that it can be brought into action on a particular fire risk much faster than a mobile unit that may have to be located, moved and connected to a water supply before any firefighting can begin. However, mobile monitors can be stored out of harms way, and this may be critically important in, say, a petrochemical fire that is frequently preceded by an explosion that might take-out any fixed equipment before it has even had a chance to discharge. So it could be argued that, while fixed monitors have something of a fix-and-forget advantage, total dependency

on them can be a high-risk firefighting strategy.

The flip-side of that is that reliance on mobile monitors inevitably means delay before firefighting can commence, and even when it does it may be piecemeal. It also demands that all of the site's possible fire scenarios are carefully assessed so that this delay is not extended while the most effective positioning of the monitors is established. This requires careful fire planning taking into account the throw characteristics of the monitors, the proximity of hydrants, the need for hoses or pumps, and possible wind conditions.

Inevitably, many sites opt for a combination of fixed and portable equipment; fixed monitors acting as the first line of defence, and portable monitors used to protect bunds, deal with fuel spillages and vapour concentrations, and cool any adjacent fire risks.

Manual or remote?

Monitors can be operated either manually by the firefighter or be remotely controlled. Remotely controlled monitors enable the firefighter to operate the equipment at a safe distance from the fire, moving the monitor in both the horizontal and vertical planes and, on the most sophisticated units on the market, adjusting the flow, stream pattern and throw. Power is hydraulic or electric. Both systems have particular benefits and many monitor manufacturers offer both hydraulic and electric options, manually operated and remotely controlled monitors.

MONITOR UPDATE



Remote control can be supplied with explosion-proof EEx (e) and flameproof EEx (de) electrical equipment in accordance with ATEX (ATmosphères EXplosibles) guidelines for when it is likely to be used in areas that may be exposed to explosive gases. These ATEX guidelines apply in Europe and

are similar to the USA's NEC (National Electrical Code) guidelines. The ATEX system is widely regarded as the more comprehensive of the two. It takes a wider range of parameters into account than the US system and has been mandatory in Europe since 2003. As a result, ATEX is often the preferred system and more recently, the IEC (International Electrotechnical Commission) standard has become mandatory for electrical equipment in Europe and Asia Pacific.

Choosing the right monitor

Monitors need to be robust and reliable, even in the most demanding working environments, and undoubtedly the best in terms of build quality, low maintenance and an extended working life are those manufactured using such corrosion resistant materials. Additionally, the jet reaction force of a monitor can be considerable, so portable monitors need to be securely restrained to ensure that they remain "on target" when in operation. Larger portable monitors are usually mounted on trailers that, depending on the stability of the trailer unit, may incorporate stabilising outriggers. Some of these trailers incorporate water tanks that increase the trailer's weight and provide additional stability.

Today, an extensive line-up of fog/jet and water/foam monitors is available from the major manufacturers.

For example, UK company, Fire Hawk, has recently supplied to an Irish refinery two 30,000 litres-a-minute manually-operated trailer-mounted monitors supplied by two independent 15,000

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litres-a-minute trailer-mounted pump sets. The contract also included a hose-laying unit with one kilometre of 125mm hose. Using this larger bore lay-flat hose reduces the pressure drop over standard 64mm and 70mm lay flat hose, plus it reduces the spaghetti-effect of standard hoses when emergency responders attempt to deliver the water capacity needed to fight large tank fire.

The Fire Hawk foam/water monitor trailer is equipped with 125mm stortz inlets feeding a manifold and 200mm waterways supplying the tiller-bar-controlled monitor, and has a jet throw of more than 100 metres, with easy control back to wide-angle spray for cooling discharge.

Industry "Big Guns"

At the other end of the market share and manufacturing spectrum, Elkhart Brass, which is widely recognised for having taken giant strides forward in the area of remote control, has developed what it calls EXM extreme monitor technology.

A key attribute that allows the EXM to deliver a high level of control and feedback is the use of what are called "absolute position sensors" that are tied directly to the monitor rotational joints. Many monitors currently use mechanical stops, proximity sensors, or encoders that count motor rotations to determine positioning or rotational limits. Each of these technologies, Elkhart believes, has limitations that provide either incomplete information, or inaccurate feedback. To explain

this, Elkhart Brass points out that, for example, mechanical stops or proximity sensors only provide a rotation limit set by the manufacturer.

EXM monitors were developed with the use of fluid flow modelling software to optimise flow paths, and are constructed with variable cross-section waterways and internal veins that minimise turbulence that wastes energy, resulting in the claim that friction-loss improvements can be achieved as large as 50 percent when compared with traditional monitors.

Another leading manufacturer, Akron Brass, has recently introduced a new electric forestry monitor. The Style 3462 Forestry Monitor is aimed at meeting the needs of wildfire or bushfire firefighters. It is said to be compact, durable and features a fully-sealed integrated electrical control system with IP67-rated waterproof locking connectors for all power and control. It has simple "plug and play" connections and the monitor's high speed motors provide proportional speed control for pinpoint stream positioning and accuracy. A wide range of nozzles are available for water, foam and compressed air foam systems (CAFS) applications.

This followed the introduction last year of a new compact manual monitor for master-stream firefighting – the Style 3430 GP Manual Monitor. It is rated for flows up to 3800 litres-a-minute with continuous 360° rotation. It has a dual-handle tiller bar for maximum control and precise positioning with an elevation range from +90° to -45°.

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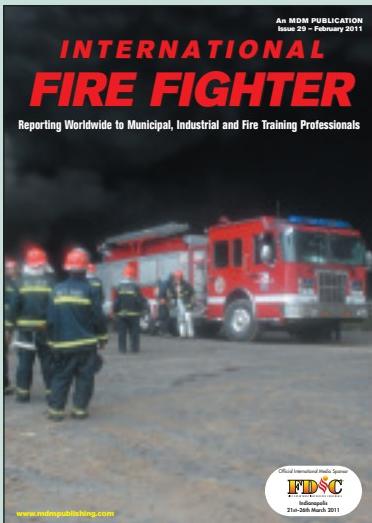
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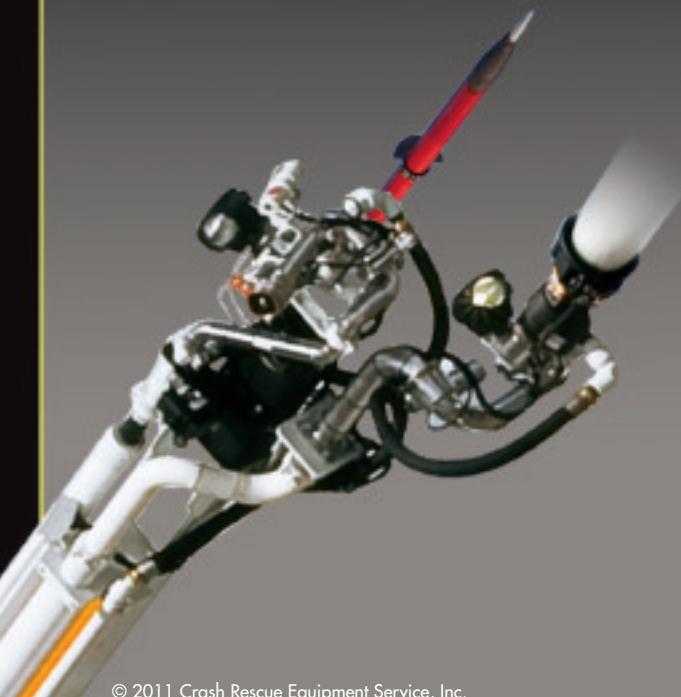
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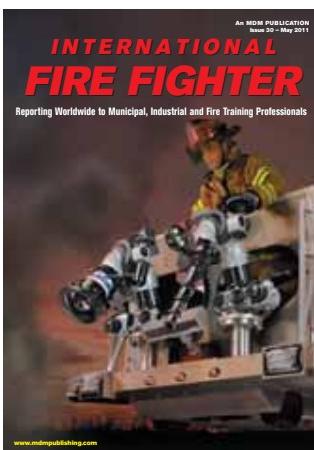
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Aerial apparatus operations often require high volume water streams delivered by remote control and manual appliances. Photo courtesy of Task Force Tips, USA.

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Graham Collins

What if?

When writing about the Haiti earthquake disaster in the previous edition of *International Fire Fighter* I commented "...because something similar is going to happen again. Where and when is anybody's guess," little did I realise how prophetic that statement was. Within a matter of a couple of weeks, Japan was struck by a catastrophic earthquake and tsunami that resulted in massive loss of life and the most threatening nuclear disaster the world has known. Now, months later, Japanese emergency crews are still battling with the aftermath of the destruction wreaked on the Fukushima nuclear reactor. According to news reports, around 300 people, working in shifts of 50, may have been exposed repeatedly to dangerously high radioactive.

The commitment of Japanese emergency crews at the Fukushima nuclear reactor is nothing short of heroism and self-sacrifice, and is in the very highest tradition of service to others.

While it will surprise no one that there are now calls for nuclear power plant safety regulations and international safety standards to be reviewed, the Japanese rescue crews are continuing to risk serious injury or death on an hourly basis. This commitment, which it appears will continue for many months to come, is nothing short of heroism and self-sacrifice and is in the very highest tradition of service to others.

Although not on the same scale in terms of loss of life, the outbreak of tornadoes that ravaged the southern US a couple of weeks ago – the largest in US recorded history – is another sobering reminder of the need for continued preparedness. Over a three-day period, 362 tornadoes struck, including 312 in a single 24-hour period, killing at least 350 people in Alabama and six other states. It was the deadliest such natural disaster since 1936.

So, with these events totally beyond our control, what can we do?

Politicians and planners must accept that they have an important role to play. They must ensure that building work is not allowed to impact on flood plains in areas at risk of flooding, that the type of building construction is appropriate to the known risk of earthquakes and storms, and that in some circumstances, emergency shelters are a condition of planning approval.

We must also be more thorough when it comes to risk assessments and be prepared to answer the most challenging "what if" questions. Risk assessments have to move out of the realm of dealing just with obvious and immediate threats and challenges and embrace the full impact of the

potential consequences of major natural disasters. It is equally important that we are more diligent about updating risk assessments and implement steps that will mitigate new challenges. How many times, following a disaster, have we heard a spokesperson say: "...this threat did not exist when the building was erected..."?

Of course, these changes will cost national economies dearly; but so do the disasters, and not just in terms of money – lives are being risked and sacrificed. We owe it to those who put their lives on the line when disaster strikes to ensure that they are fully trained and equipped, but we also owe it to them to take proper care that the circumstances leading up to that disaster have not been made worse by a lack of leadership or legislation, expedient political decisions, short-sighted development of the environment, or a lack of constant diligence. Far too much is at stake. **IFF**



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Turkish Wildland Fire Fighters Protected by PBI Triguard

The use of personal protective equipment (PPE) is a must to during wildland fires, and Personal Protective Clothing is the most important part of the PPE arsenal.

Protective clothing used in wildland firefighting differs from that used in structural firefighting. The main difference is that structural firefighting suits have four layers: and outer-shell fabric; moisture barrier; heat barrier; and inner lining. On the other hand, wildland fire suits are only one layer because of the high heat stress in forest fires that can even cause heart attacks. Therefore the suits they are wearing must be as light and comfortable as possible.

Develop/designing the most protective, most comfortable, lightest and most durable suit is the aim of the garment manufacturers, investing huge amounts in R&D to achieve this goal. It is not enough to use a lightweight fabric in the suit; it should also be very durable because there are numerous sharp objects such as bushes in a forest fire that can easily tear the fabric. The firefighter could be injured or even killed if direct flames come into contact with the unprotected body in case of a break or tear in outer fabric. Therefore the tensile and tear strength of the fabric must be much higher compared with conventional flame-resistant fabrics.

Wildland firefighters in the Republic of Turkey, Ministry of Environment and Forestry, General Directorate of Forestry, are using the most suitable garment that satisfies these needs:

- **Protection:** The heat and flame resistance of the fabric used by Turkish wildland firefighters is the best compared with other materials on the market, giving them the best possible protection.
- **Comfort:** The weight of the fabric used by Turkish wildland firefighters is 165 g/m² and this is the lightest garment fabric at the moment. The air permeability when tested according to ISO 9237 at 100 Pa is at least 175 litre/m²xs. This makes it the most breathable fabric, which means low heat stress during fire.
- **Durability:** The tensile strength of the fabric used by Turkish wildland firefighters is at least 1600 N/5 cm in warp and at least 1100 N/5 cm in weft according to EN ISO 13934-1. The tear strength is at least 70 N in warp and at least 60 N in weft according to EN ISO 13937-2. This high tensile and tear strength increases the lifetime of the garment and protects the firefighter.
- **Design:** Different aspects of wildland firefighting are taken into account in designing the suit. Flame retardant yellow-silver-yellow reflective tapes increase the visibility in day and night and the comfort is increased by means of curved-type stitching on elbow and knee area. There are a lot of pockets enabling firefighters to carry various items of equipment.

Turkish wildland firefighters are using the lightest, most comfortable and most durable suits available today – PBI TriGuard.



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Foam liquid pump manufacturer, ALBANY ENGINEERING is highlighting several of its latest models that are suitable for high viscosity foam concentrates, where the focus is on compactness, simplicity, robustness and versatility.

They all have metering ability and are capable of withstanding a degree of abuse and dry running for short periods. Albany pumps are manufactured from bronze, stainless steel or iron, and their capacities span from the smallest to over 1600 litres-a-minute at pressures of between 16 and 21 bar and more. Twin screw pumps are manufactured for flows up to 300 m³/hr or 400 m³/hr.



The main applications are cited as being: for fire engine and foam tender power take-off for engine or hydraulically-driven foam pumps, with or without an inbuilt safety relief valve; within the offshore petrochemicals industries, where Albany pumps are constructed to API 676 specification and NFPA 20; and for road tanker-mounted for foam transfer to fill fire engine tanks. Other applications include portable, lightweight foam concentrate pumps, either petrol or diesel engine driven.

For more information, go to www.albany-pumps.co.uk

Thermal Imaging Camera Deal



The Welsh fire and rescue services have taken delivery of 165 of the E2V's Argus4 thermal imaging cameras. They are said to offer advanced digital imaging technology that provides "by far the best image quality of any handheld thermal imaging camera on the market today".

The Argus4 camera is especially designed for firefighters, with a range of features that help evaluate its surroundings, particularly in emergency situations with zero visibility. It enables firefighters to see through smoke, identify and rescue casualties and locate hot spots or the seat and spread of a fire. The Argus4 weighs less than 1.3kg and comes with up to x4 zoom, 13 colour settings and a picture capture facility, capable of taking up to 100 pictures, which can then be stored and downloaded to a PC/Laptop through a USB cable for quick transfer.

For more information, go to www.argusdirect.com

Vehicles for Portsmouth F & R



The fire, rescue and emergency services in Portsmouth, Virginia, USA is about to take delivery of five new Pierce Ultimate Configuration (PUC) vehicles from PIERCE MANUFACTURING. The order is for four pumper and one aerial ladder; all on Pierce Arrow XT chassis.

Pierce says that its PUCs design removes the bulky pump house and positions the fire pump below the cab. This lower and space-saving location is claimed to make the vehicle easier to use, operate more safely, service and manoeuvre, all without compromising firefighting capabilities. PUC is available on all Pierce custom chassis in side and top mount configurations, as well as on all aerial ladders.

For more information, go to www.piercemfg.com

New Safety Shower Valves

A new range of control valves from HUGHES SAFETY SHOWERS that was developed using 3D modelling software is claimed to focus on durability, reliability and ease of operation.

There are five sizes and a range of end connections to step up or step down to different pipe sizes. Straight or cranked actuator levers can be fitted at 45° or 90° to the valve body, providing a choice of operating positions for maximum flexibility. The valves have a low operating torque and comply fully with the requirements of American National Standard ANSI Z 358.1 2009.

The new design uses investment casting techniques for enhanced quality and precision. This is further boosted by the use of stainless steel construction that will withstand the harshest environments and site conditions. In an emergency, casualties often use excessive force to activate the shower, which transmits through the lever mechanism to the operating valve stem. On many valves this is a weak point, resulting in instantaneous or, at the very least, premature failure. The new design eliminates the risk of damage by using a thicker, heavy-duty stop plate with multi-point contacts to distribute loading and withstand the roughest treatment.

For more information, go to www.hughes-safety-showers.co.uk



Communication Aid for Stricken Japan

Following the earthquake and consequent tsunami that have devastated north-east Japan and caused a nuclear disaster that ranks in severity alongside the 1985 Chernobyl disaster in the Ukraine, the UK International Search and Rescue Team (UK-ISAR) was equipped with SEPURA hand-held radios and ancillary equipment to assist in the search and rescue activities. The radios were used in direct mode without TETRA infrastructure, and did not require any special training before becoming operational.

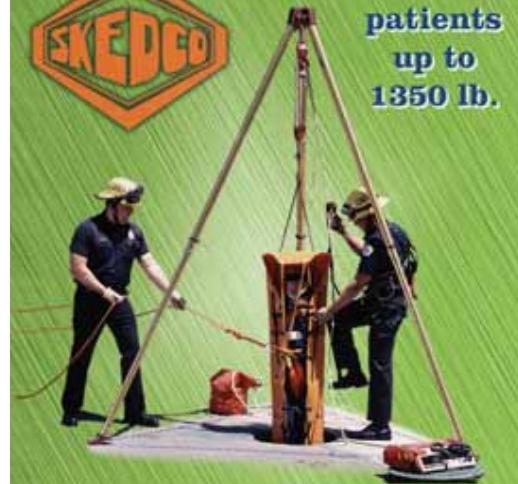
The UK-ISAR team took eight tonnes of specialist rescue equipment with them, including heavy lifting and cutting equipment to rescue people trapped in the debris. Its specialist search and rescue dog team joined the efforts to detect the scent of live casualties trapped under rubble. This rescue work is highly specialised and requires constant training, but a search dog team can detect casualties that expensive high-tech electronic devices cannot. The UK-ISAR team joined Japanese rescuers and other international search and rescue teams.

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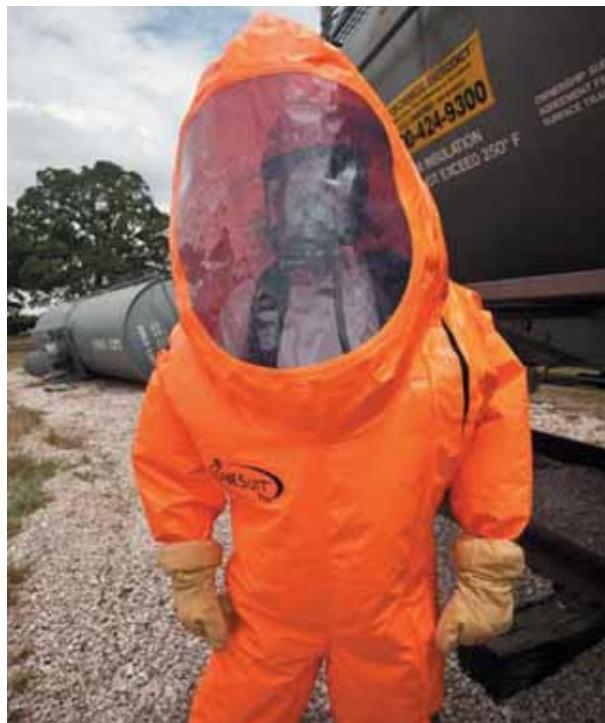
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Hazmat Suit Life Extended

The shelf life of ONEsuit Pro gas-tight chemical-protective hazmat suits from SAINT-GOBAIN PERFORMANCE PLASTICS has extended from seven to ten years following accelerated ageing and resistance testing. This improves longer-term cost efficiency, while ensuring maximum protection over a ten-year period for fire, chemical and industrial organisations.

According to the announcement, the Coretech material that is used in the suit has been tested against harsh physical and climatic conditions to ensure that it maintains its high resilience, durability and flexibility performance levels and suffers no significant degradation. This means no routine maintenance is required on the suits for ten years following purchase.

Certified to both EN 943-1 and EN 943-2, the suits are available in ET (emergency team), Industrial and CBRN versions for chemical,



biological, radiological, and nuclear incidents.

The ONEsuit Pro also incorporates advanced exhaust valve technology, enabling the garment to be inflated by retaining exhaled air from the self contained breathing apparatus (SCBA) to create a comfortable distance between the user and the material. By lessening the pressure of the direct weight of the suit, comfort and mobility are enhanced as the suit is kept well above the helmet of the user, ensuring good visibility.

The suit is designed with a completely sealed construction of exhaust valves that do not require any annual or routine maintenance, and are tamper-proof. Key to this construction is the use of silicone rubber diaphragms to prevent inward leakage.

For more information, go to www.saint-gobain.com

Platform Help at Rio Carnival Warehouse Fire



A huge warehouse fire that destroyed thousands of costumes and floats destined for Rio de Janeiro's annual carnival was tackled by ten teams of firefighters using platform trucks manufactured by Italian firefighting vehicle manufacturer, CTE.

The fire ripped through warehouses where samba groups were preparing for carnival, incinerating more than 8,000 feather and glitter costumes and many of the big, meticulously decorated floats. One samba group alone had 3,255 outfits destroyed.

The vehicles used by the Rio de Janeiro fire department were from CTE's B-Fire range with platforms reaching up 33 metres. Each is equipped with a non-telescopic main jib and a second jib, an emergency ladder and a water/foam line.

For more information, go to www.ctelift.com

Groundbreaking Foam Concentrate Goes Live

A foam concentrate previewed last year at Interschutz in Germany has been launched by TYCO FIRE PROTECTION PRODUCTS. Heralded by the company as "groundbreaking", the Skum AP3x3 foam is described as an environmentally friendly concentrate that is free from fluorine and other halogenated organic chemicals. It is claimed to deliver a maximum fire performance that is equal to, or above, the level of contemporary AFFF and AFFF-AR foams and has achieved compliance with EN1568, yielding optimum fire performance and burn-back ratings according to parts three and four.

The concentrate proportions at 3% for both polar and non polar liquid fuels, and is suitable for all types of foam firefighting applications using standard foam proportioning and application hardware. The foam uses a unique formulation of new performance chemicals never before applied in firefighting foam technology.

For more information, go to www.tycofsbp.com

Quick-start Cards

Quick-start cards are now included in shipment with every Altair and Altair Pro single-gas detector from MSA.

The new colour-printed, two-sided quick-start cards offer a clean and easily-readable sequence of basic instrument operation and setup that includes activation, alarm set point change, fresh air setup, and web links.

The Altair, Altair 5 and Altair Pro detector bulletins have been updated to give them a more modern look. Other changes include information updates, such as replacing Five Star link references with MSALink, and updated approvals.

For more information, go to www.msanet.com



Indian Deal for Comms Company

TETRA digital radios company, SEPURA, has signed a major new channel partnership agreement with Raxa Security Services Limited, a subsidiary of the leading Indian infrastructure and services operator, GMR Group.

The deal is said to reflect the huge potential for TETRA systems in India, as a result of increasing public and private sector investment in infrastructure across the country. GMR Group's core business is the delivery and operation of infrastructure projects, including Delhi and Hyderabad airports, together with numerous road, power generation and Special Economic Zone schemes. All of these projects require modern IT and communications infrastructures to ensure secure and safe operating environments.

For more information, go to www.sepura.com

Foam Manufacturer Acquisition Enhances Global Presence

SOLBERG SCANDINAVIAN AS, one of the largest independent firefighting foam agent manufacturers in Europe, has been acquired by Amerex, a manufacturer of hand-held portable extinguishers and fixed special-hazard fire suppression systems.

The acquisition is described by the company as enabling Amerex to bring advanced, environmentally-sustainable firefighting foam technology to the Americas, and will give it a global presence as a full-line manufacturer serving the fire protection and firefighting industry.

Solberg is based in Bergen, Norway, and has been involved in the manufacture of firefighting foams since the 1980s. The company is recognised throughout Europe and the Asia Pacific Region for its environmentally-sustainable fluorosurfactant and fluoropolymer-free Class B firefighting foam. Solberg also manufactures a complete range of traditional Class B synthetic aqueous film forming foams (AFFF) and alcohol resistant concentrates (ARC), as well as USA Forest Service approved Class A and high-expansion concentrates. It has a significant market share in northern Europe and Australia, where its technology is well established in the aviation, petroleum, oil and gas markets.

According to the acquisition

announcement, Solberg will continue to operate as an autonomous business. In addition to firefighting concentrates, the Solberg offering will include standard and customised foam suppression systems, hardware and accessories.

Solberg customers will continue to purchase Solberg firefighting foam through the existing distributor network.

The company has immediate plans to begin to establish a sales distribution network throughout the Americas, and a new plant that will manufacture foam agents, as well as an indoor fire test facility that is being planned for the Americas.

For more information, go to www.solbergfoams.com

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Tests Prove Gel's Credentials

Evaluation tests conducted in the USA on a new non-toxic and biodegradable firefighting gel have demonstrated impressive fire knockdown and suppression characteristics.

EFI Global, a full-service forensic engineering and fire investigation group based in the US with clients worldwide has completed tests on a new biodegradable and non-toxic firefighting water enhancer.

The objective of the testing was to evaluate TetraKO's performance for fire knockdown and suppression, and to test its ability to preserve forensic evidence at a fire scene. For comparisons, the TetraKO was tested side-by-side against plain water and traditional Class-A foam. The tests were conducted on a farmhouse, two garages, a barn and three three-metre by three-metre pods. The tests concluded that 1,700 litres of water were required to extinguish the fire in the pod where water only was used; 1059 litres were required to extinguish the fire using the traditional Class-A foam. However, the TetraKO solution used only 151 litres and put out the fire in the pod in just eight seconds.

TetraKO is a Class-A water enhancer that transforms water into an adhering solution that can be pumped through standard firefighting equipment that requires no modification to dispense the solution. A key attribute of its proprietary dual thickening agent is that it sticks and stays where applied. When heated by fire, adhered TetraKO becomes even thicker and releases a dense steam, dramatically aiding in fire suppression because of the increased, resulting calorie absorption. It is the first firefighting water additive that uses no super absorbent polymers.

The product is independently certified as non-toxic and biodegradable, and its development is a direct response to the growing concern over the toxicity of existing firefighting foams and super



absorbent polymer-based products used by fire departments. It also addresses the problem of the large amounts of phosphorus and ammonia dioxide – harmful to fish, mammals, plants, streams and rivers – contained in the leading fire retardant used on wildfires.

"We wanted to conduct test burns in the house without burning that structure to the ground," said Terry Parks, CFI/CFEI Fire Investigator. "We did not want the fire to get into the attic space, so we sprayed TetraKO on the ceiling of the lower rooms we planned to burn. Our test fires reached an intense temperature, but the flames never made a mark on the ceiling that we had coated."

He continued: "Next, we set fires in each of the three pods, using fuel loads that were as identical as possible to facilitate comparison burns. We allowed each pod to get to flashover, and then instructed the fire department to extinguish the fires. In all instances, we used identical equipment – a 45mm line and fog nozzle set at a semi-straight stream – but the results were far from identical. What the TetraKO people did not know is that later the same day, we decided to burn all three pods to the ground for easier clean up, but we could not get the TetraKO pod to ignite because the coating was still on the wood and furnishings."

Terry Parks concluded: "Later during the tests, gasoline was poured into one of the farm structures and ignited and TetraKO was used to extinguish the fire. We took samples in the area of origin and obtained a positive reading for gasoline. In other words, the TetraKO product did not affect our forensic samples. As fire investigators, this finding is very important because it demonstrates that TetraKO will not impact negatively on a fire investigation."

For further information, go to
www.tetrako.com





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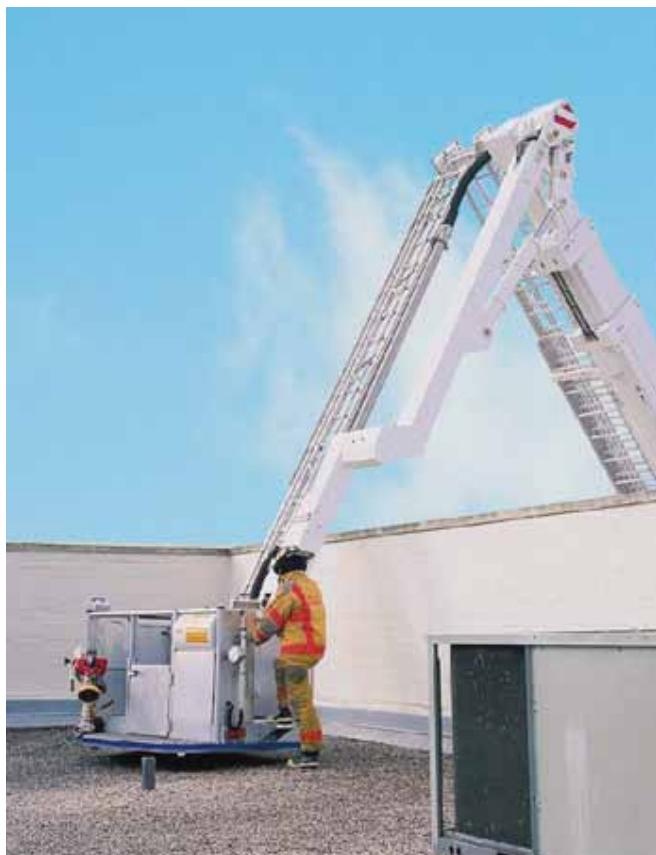
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Pierce Support for Bronto Platforms

PIERCE MANUFACTURING has signed an exclusive distribution and supply agreement to market and support Bronto Skylift aerial platforms throughout North America. Pierce will offer Bronto products, including the 50-metre RLP – the tallest aerial platform available in North America – on its Arrow XT, Impel, Quantum and Velocity custom chassis, while the Pierce dealer network will provide comprehensive service, parts inventory, training and support for new and existing Bronto customers.

The Bronto offering features up-and-over and below-grade reach to enable more effective rescues in a wide range of scenarios, a telescopic cage boom, a large rescue platform with more room for firefighters, and a surprisingly compact design for manoeuvrability.

For more information, go to www.piercemfg.com

LED Handlamp Boosts Output

A new ATEX-approved handlamp introduced by WOLF SAFETY incorporates the latest generation of high power LEDs that increases light output by 75%, from 200 lumens to 350 lumens.



The Wolflite XT-70 with spot and flood beams is already in use for portable ATEX general-purpose lighting on vehicles by a number of UK fire and rescue services. This particular model has also achieved success with firefighters in Austria, France, Italy, and Switzerland and in the global marine market, where the Wolflite XT is used as a firefighting handlamp on oil and gas tankers. The Wolflite XT-90, with additional coloured signal LEDs, is also utilised in the oil and gas production sector, and a variant with red and amber LEDs has been adopted by Vienna Fire Brigade.

For more information, go to www.wolf-safety.co.uk

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Motor Protection for Submersible Pumps

The 3-phase 400V submersible pumps from MAST PUMPEN, the German manufacturer of portable wastewater, sewage pumps and pumps for dangerous liquids, are equipped with a unique full motor protection system for all kinds of environmentally-caused breakdowns called the MAST MD-Electronic.

No manual phase-change is needed, plus there are the additional benefits of temperature protection, phase-failure protection, voltage monitoring and a mechanical seal-guard. The temperature protection prevents damage to the electric motor by overheating; the phase-failure protection shuts down the pump if one of the three phases breaks down; and the voltage monitoring prevents the pump from running in the event of a too-low voltage supply.

The mechanical seal-guard automatically monitors the mechanical seal – the critical wear part. If the mechanical seal is worn out, the electric motor can be damaged by in-flowing water, but not with the MAST 3-phase 400V submersible pumps, as the mechanical seal-guard automatically stops the pump from running. Additionally, all MAST submersible pumps are dry-running safe, and do not have a maintainable oil-chamber.

For more information, go to www.mast-pumpen.de

Fast Response Combination Tool unveiled



With its fast opening and closing times, the new SC 350 E from LUKAS has been designed for fast first-response and difficult to reach emergency applications, in multiple-victim accidents or in rough terrain. It is stated as requiring no set-up time, as the combination tool is ready for immediate use. Designed for one-man operation, it requires no motor pump, no hoses and no equipment changes between cutter and spreader; it combines spreading and cutting with the mobility of Lukas' eDRAULIC technology.

For more information, go to www.lukas.com



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Confined Space Gas Detector

A new portable confined space entry (CSE) gas detector has been added to the CROWCON ranges. The Gas-Pro is being promoted as having application-driven features that include a top-mount display, internal pump, detection of up to five gases simultaneously, and +ve safety – a tri-colour status indicator flexible enough to comply with differing regulations.

For more information, go to www.crowcon.com

Boot Brand Unveiled



A new technology-led footwear range for use in extreme conditions has been unveiled by GOLIATH FOOTWEAR to differentiate high-technology products from the company's everyday safety footwear. The YDS Boots brand is designed specifically for fire and rescue personnel throughout the UK and mainland Europe.

YDS boots incorporate premium technologies such as GORE-TEX and high performing dual density rubber

(DDR) injected soles. DDR is a specially formulated rubber compound that is injected in two densities into the uppers of the boot to create a lightweight shock absorbing cushioned bed for the foot.

For more information, go to www.ydsboots.com

Vehicle Extrication Poster Offer

A poster showing the basics of vehicle rescues and different methods of creating access to trapped victims has been published by rescue equipment specialist, LUKAS. It provides easy-to-follow expert guidance on roof removal, complete side removal and foot-well expansion.

Designed to assist trainers during internal training, and be placed in the fire station to remind firefighters of the essential steps, copies of the poster are freely available from any Lukas dealer.

For more information, go to www.lukas.com

Virgin Islands get ARFF boost



The US Virgin Islands Port Authority has taken delivery of three Striker 1500 aircraft rescue and firefighting (ARFF) vehicles from OSHKOSH AIRPORT PRODUCTS GROUP. One has gone into service on the island of St. Thomas and two on the island of St. Croix.

The Virgin Islands is a major vacation destination in the eastern Caribbean, 1,800 kilometres south-east of Miami, Florida, and the new vehicles will enhance the emergency response capabilities of the islands' ARFF professionals.

The Striker 1500 offers a 4x4 all-wheel-drive axle configuration and technologies such as TAK-4 independent suspension, triple-agent firefighting capabilities and Command Zone electronics for enhanced manoeuvrability, firefighting power and reliability. It accelerates from 0 to 80 kilometres and hour in 25 seconds. Other features include a 5,678-litre water capacity, 795-litre foam capacity, roof turret, bumper turret and six under-truck nozzles. The US Virgin Islands' vehicles also feature a Driver Enhanced Vision System (DEVS) and infrared cameras to improve safety while responding on the airfield.

For further information, go to www.oshkoshairport.com

Rescue from Partially Submerged Vehicles



Ian Dunbar

Holmatro

Firefighters must strive to be prepared for every eventuality, and foresee the types of incidents where they may be called on to perform a rescue. Swiftwater rescue and extrication from vehicles are of course separate disciplines and each has its own dynamics. But what happens when there is an operational requirement for them to be used simultaneously, can this be achieved practically and safely?

Such incidents have the potential to catch us unaware, if we do not prepare adequately. 'Crossover' training (or training that involves multiple disciplines – in this case vehicle extrication techniques and swift water rescue) must be considered as part of your approach to operational preparedness.

Safe approach

The very nature of such incidents will mean that your standard approach to road traffic collisions will be thoroughly compromised. Access to the vehicle and casualty will be delayed until a safe system of work can be established, which includes rescuers wearing personal protective equipment (PPE) conducive to both water rescue and extrication.

Identifying vehicle fuel types – for example, hybrid – and isolating the battery to neutralise the hazards posed by airbags, will be difficult. Full stability of the vehicle will be hard to achieve due to its position in the water. This compromises scene safety and the casualty's condition. Space creation may require hydraulic rescue equipment to be partially submerged in water. Will your tools operate safely and efficiently in such conditions? Not all are designed for this, and knowing the limitations of your tools is vital.

Once access has been gained, your casualty's condition must be assessed as at any other incident using kinematics, mechanism of injury and primary and secondary surveys. But now your casualty is submerged in cold and possibly foul water. This complicates already life threatening traumatic injury and increases the need for a rapid extrication.

If an incident is foreseeable, then it should be prepared for. The promotion of theoretical

Ian Dunbar is Rescue Consultant at Holmatro. Before joining Holmatro he was a training officer in the UK Fire & Rescue Service with a background in both technical and medical rescue. Ian provides consultation and training to emergency services departments around the world

For more information go to www.holmatro.com



© Photo by Jeffrey Koper

discussion, followed by practical application in line with local standard operating procedures (for both disciplines) and using the most appropriately designed tools for the job, will best prepare rescuers for such eventualities.

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Above all



Fighting High-rise Fires

High-rise buildings can take a considerable length of time to evacuate, so firefighting at height needs to be quick and effective if lives and assets are to be saved.

Roman Eichberger

Rosenbauer
International AG

The construction of high-rise buildings is much older than many people realise, making their appearance in ancient Rome and several other cities in the Roman Empire. However, they really started to make an impact on cityscapes a hundred or so years ago when man started scraping the sky with high-rise buildings, with the term "skyscraper" finding its place in the architectural vocabulary in the late 19th century when applied to steel-framed buildings of at least ten stories.

Today, an unbelievable height of 828 meters has been reached with the Burj Khalifa in Dubai – more than twice the height of the once tallest high-rise apartment building in the world, Chicago's 100-storey John Hancock Centre that stands at 344 meters – with by far the largest number of skyscrapers today standing on Chinese soil.

However, the urge to scale ever greater heights harbours major challenges and poses nearly insoluble problems when it comes to firefighting. In particular, the question as to how firefighting

water can be transported hundreds of meters upwards continues to occupy the minds of firefighters around the globe.

Fires in high-rise buildings are extremely challenging, as has been confirmed by operational reports from all over the world. In February 2009, for instance, the Mandarin Oriental Hotel in Peking caught fire shortly before it was due to open, with the probable cause being determined as fireworks that were set off to celebrate the Chinese New Year. The local fire brigade with its fire and rescue service equipment designed to support firefighting in high buildings was able to carry out firefighting operations only up to an elevation of approximately 40 meters, and was effectively powerless on the floors above that height. Inevitably, the 159-metre high, architecturally remarkable building burned out completely.

This example clearly shows the complexity of the problems associated with the vertical delivery of firefighting water when relying on conventional

firefighting technology. From a theoretical point of view, a pumping pressure of approximately 1 bar is required for every ten-meter vertical height when using water for firefighting. Actually, however, higher pressures are needed due to frictional losses. So, the vertical delivery of firefighting water in these applications lies below 100 meters, given a pump pressure of approximately 10 bar.

If the situation – as was the case in the Mandarin Oriental Hotel in China – calls for greater vertical delivery heights, the pump capacity required for the purpose can no longer be achieved using vehicle integrated pumps. Therefore, additional pumps for “vertical delivery” of the firefighting water would have to be installed within the building. This entails considerable expenditure in respect of the procurement, maintenance and operation of the plants.

The conventional approach, primarily in case of taller buildings, therefore comes quickly up against its capacity limits and needs to be reviewed. For this purpose, an analysis of the current fire-protection appliances and their tactical handling in high-rise operations is advisable.

Among other things, attention has to be paid to the constructional, safety-related and operational requirements for getting a building license. A part

the building. If, however, the top floor can no longer be reached, then an adequate, sufficiently effective fire extinguishing system has to be set up. This is needed, since fire brigades’ firefighting operations from outside are, as a rule, no longer possible beyond the reach of aerial ladders and water turrets. Often, the only option is to resort to inside attack, in order that the fire in the upper floors can be effectively extinguished. For this purpose, rising mains (rigid piping) are provided in the building, with the option of the following basic variants.

Wet rising mains

As a rule, wet rising mains with wall hydrants and hose are installed, with their use being almost exclusively for the fire brigade (these are almost never used by building owners). The operational units are then, however, confronted with firefighting technology and equipment, the execution and condition of which they sometimes do not have any information.

This can, for example, result in errors when using these appliances or even miscalculations about the effectiveness of the systems being used. Furthermore, additional costs arise due to the installation of hoses and steel pipes in each floor,

**Often, the only option is to resort to inside attack, in order
that the fire in the upper floors can be effectively
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are provided in the building, with the option of the
following basic variants.**

of these requirements is the preparation of a comprehensive fire prevention strategy with general safety goals. Measures for each building type can, for instance, be derived from:

- Structural measures: external walls, facades, balconies, roofs, staircases, shafts, elevator etc.
- Plant-specific measures: ventilating systems, elevator, fire alarm systems, rising mains, wall hydrants, sprinkler systems etc.
- Organisational measures: for protective fire prevention – parking areas and attack routes for the fire brigade; periodical check, maintenance and servicing of safety-related installations; providing a building safety service etc.

These considerations result, among other things, in the following important questions being raised for the formulation of a comprehensive fire prevention strategy:

- 1 Which actions can be executed to best support the local fire brigade at the scene of the fire?
- 2 Which measures should be envisaged in order that the responsible fire brigades have the option of using familiar equipment and apply the practices that they have trained for using the equipment?

A major consideration for such actions and measures is the particular building's height. If the top floor still lies in an area that can be reached with an aerial ladder (there are country-specific guidelines for determining this), then the firefighting operation can be carried out even from outside

and/or due to the high pressure pumps required at greater heights that are necessary to ensure that all the wall hydrants are supplied with sufficient water pressure. Associated with this are significant maintenance requirement to maintain hygienic, germs-free operation and technical requirements such as pressure rise pumps and the check of operational readiness.

Dry rising mains

More and more often, dry rising mains with couplings are also being used. During a firefighting operation, the fire brigade uses this facility to deliver the extinguishing agent to the respective floor with the help of the firefighting technology installed in the fire truck.

To achieve this, the fire truck is connected to the dry rising mains using the hose, and the extinguishing medium is subsequently delivered to the respective floor. There, the firefighting appliances are coupled to the valve outlets and the fire is extinguished in the usual way. Thus, the dry rising main represents a “connecting piece” in the extinguishing line. The appliances used in the process come from the fire brigade and are used on a daily basis. Hence, the operational units possess sufficient experience in the handling of the appliances used and also in their maintenance, so the fire brigade has the required attacking power. Additional costs for maintenance etc. are not applicable in the case of dry rising mains.

“
High Rise Fire,
Heavy Smoke
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22nd
Floor



Fires in high-rise buildings beyond the reach of ladder trucks pose unique and potentially dangerous challenges to firefighters attempting to battle the blaze directly. Elkhart's HERO Pipe system is a true game-changer. Because the HERO Pipe can deliver a high volume of water at the point of attack from the floor below, it is the first viable solution for high-rise fires.

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The CAFS option

As was described earlier, vertical delivery of firefighting water is limited, on the one hand by the reach of the aerial ladders (in an external attack) and, on the other hand by physical laws (approximately 1 bar at ten meters). A solution is offered here by the highly efficient foam extinguishing system CAFS (Compressed Air Foam System).

Contrary to the conventional air foam process (passive foaming), wherein the water-foam agent mixture is foamed by the intake of air at the nozzle, foaming in CAFS is done actively, with compressed air, in the extinguishing system, in other words, before entry into the fire extinguishing hose. This results in excellent foaming quality (homogeneous foam bubbles with very high energy content) leading to several now well-established advantages:

- Greater throw range and height due to active insertion of energy in the form of compressed air.
- Simple handling and quick change of position due to light hoses (approx. 25% to 90% air content in CAF-foam).
- Increased extinguishing efficiency and low use of extinguishing agent due to homogeneous CAF-foam.
- Multiplication of the quantity of extinguishing agent (depending upon the set expansion ratio) due to active foaming.
- Very good adhesion even on vertical surfaces.
- Sustained cooling effect and suppression of re-ignition.

So, what distinguishes CAFS from other conventional systems, especially while fire fighting in high-rise buildings? This question can be answered by citing another important advantage, namely greater elevation due to little weight and high energy content. This already permits remarkable delivery heights of more than 200 meters as was shown using Rosenbauer's standard **CONTI CAFS 30C** system during a trial on a building in Guangzhou in China.

In the meantime, producers that have devel-

oped this technology, particularly for vertical delivery, have entered the market. For instance, Rosenbauer has been offering a product by the name of **SKY CAFS** as a solution since the end of 2009. The first fire truck with a **SKY CAFS** system was supplied in November 2009 to the Foshan fire brigade, 15 kilometers from the southern Chinese economic hub of Guangzhou. **SKY CAFS** is available as a stand-alone version or in combination with a **CONTI CAFS 30C** system.

In the process, compressed air is generated using a compressor that is directly driven by a power take-off using a belt. In **SKY CAFS** operation, the compressor has an output of 3,000 normal litres-a-minute at 12 bars and 4,000 U/min. The drive power required for this is 23 kW.

The CAFS system is secured at 10 bars using a safety valve after the CAFS mixing chamber and so conforms to the vfdb directive "Technical Report on Compressed Air Foam (CAF)". The delivery height achievable with this system is 400 meters, which has been demonstrated during a vertical delivery trial operation. Alongside the Reisseck mountain railroad in Carinthia in Austria, hoses with an overall length of 800 meters were laid out and CAF was successfully delivered from the valley to the mountain station. This elevation is possible due to an optimisation of the integrated complete system.

At the same time, parameters such as pressure/frictional losses, expansion ratio and customised control and regulation technology are of decisive importance. Considering that there are currently only a few buildings in the world that are higher than 400 meters, **SKY CAFS** offers a solution that covers more than 99% of all skyscrapers. Hence, the extinguishing system represents an important addition to operational protection firefighting systems such as automatic fire alarm systems, sprinkler systems, since this strengthens the attacking power of the mobile operational units. The only prerequisite for operation is the presence of a dry rising main installed in the high-rise building.

Roman Eichberger is head of Production, Business Unit, Fire Fighting Components

For further information, go to www.rosenbauer.com

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Graham Collins

Cameras update

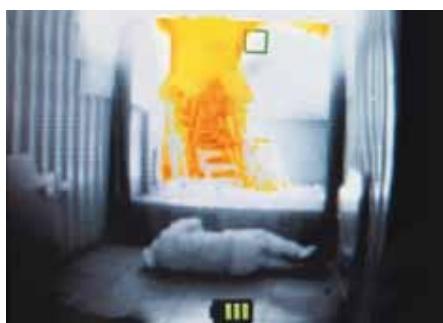
The recent spate of earthquakes and tornados has once again highlighted the importance of cameras in confined space operations as well as when rescuing trapped victims from burning buildings. Here we review just a few of the new models on the market.

Intrinsically safe solution

The new UCF range of thermal imaging cameras from DRAEGER SAFETY is being heralded as freeing firefighters from having to conduct a risk assessment before taking a thermal imaging camera into a potentially explosive environment, as the range includes models that are intrinsically safe and have ATEX Approval applied for.

The cameras provide "the complete picture" by combining traditional fire-fighting and normal view modes. One hand is left free for the firefighter to feel his or her way or help casualties, while the other hand operates the lightweight camera, single-handedly via touch button controls.

Draeger believes that being able to see the "complete picture" is essential for accurate, fast decision making. When entering an incident, firefighters need to determine the source of heat and the location of people – particularly casualties – as



quickly as possible. The broad thermal operating range of the UCF cameras allows the traditional modes of "firefighting" and "normal" to be viewed simultaneously, enabling the user to see both the fire source and other people in a single clear image.

Hot spots, which can be a danger after dowsing, need to be avoided or dealt with

effectively. Often invisible to the naked eye, they can be identified easily with the UCF's integrated laser pointer that pinpoints the exact location of any thermal areas. In addition, when entering a new area such as a doorway, hatch, window, confined space or even turning a corner, the user can select a freeze frame facility to view hidden dangers. This allows the firefighter to observe the space, decide a plan of action and, if necessary, consult and share the image with colleagues before entering the danger zone. A data transmission option that uses both video and sound can be used to send images to the command team. These images can also be recorded for immediate or post event playback for training and evaluation purposes.

For more information, go to www.draeger.com

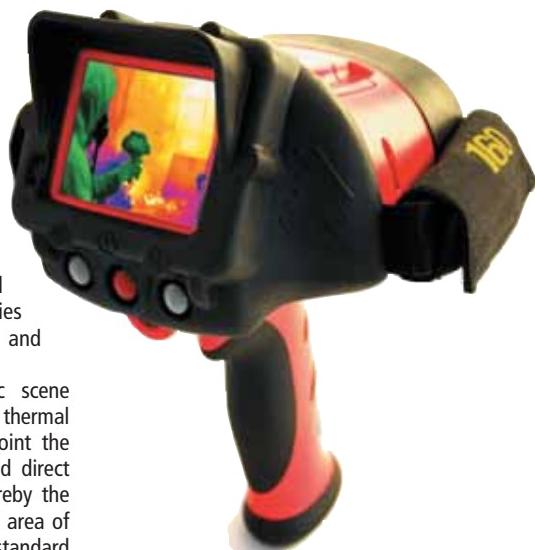
Vision on a budget

Created for budget sensitive fire departments who still demand all of the crucial camera features, is how E2V describes its new Argus4-160 thermal imaging camera. It uses an uncooled high-resolution 160 pixel by 120 pixel, amorphous silicon (ASi) microbolometer detector, and has been designed using advanced digital imaging technology for a sharper picture and to provide superior performance.

The Argus4-160 is being promoted as being a simple-to-operate, self-contained and robust camera that can be used in a fully automatic mode of operation. The camera's casing is made from high quality Radel R-5100, which was chosen for its strength, resistance to heat, water and impact. The camera is sealed to IP67, to withstand driving spray and immersion in water, and can tolerate extremely high temperatures. The camera is also lightweight, ergonomic and capable of withstanding harsh environments.

The camera has been specifically designed to help firefighters to see in conditions of zero visibility – including complete darkness – and smoke. It allows them to identify and rescue casualties, locate hot spots and the seat or spread of the fire. It can be used with all the Argus4 camera accessories including truck mounts, transmitters and video accessories.

Standard features include dynamic scene colourisation (EDSC) that colourises the thermal image to allow the firefighter to pinpoint the hottest areas within the fire scene, and direct temperature measurement (DTM), whereby the temperature of objects within a defined area of the thermal scene is displayed. Other standard features are SceneSave digital image capture that allows up to 100 images to be stored. These can then be viewed or deleted using the remote control supplied, and tri-mode sensitivity – an expanded third-level of sensitivity for very high



scene temperatures – in excess of 800°C – to enable clear imagery at all temperatures.

For more information, go to www.argusdirect.com

Higher resolution camera

Said to be the fire service industry's first low-cost, personal-issue thermal imager, the BULLARD Eclipse is now available with a 160 by 120 high resolution engine. This optional feature enhances the versatility of the Eclipse by providing firefighters with clearer, crisper and more detailed images, making the Eclipse suitable as an analytical and navigational tool and offers the fire service an opportunity to bring thermal imaging to more firefighters.

In addition to the higher resolution engine, the Eclipse can be equipped with optional advanced features including Bullard's electronic Thermal Throttle (ETT). This aids firefighters in revealing hidden fire and distinguishing hotter objects, saving firefighters critical time and preventing costly or dangerous mistakes. Other optional features available include high-heat colourisation, temperature measurement and customised start-up graphics.

Also claimed to be the industry's smallest and lightest thermal imager, weighing 680 grams, the Eclipse easily fits into the palm of a firefighter's hand.

For more information, go to www.bullard.com



Imager offers more



A new thermal imaging camera that is claimed to be much more than solely used for firefighting has been introduced by FLIR SYSTEMS. The company says that it can also be used for support applications, scene assessment, incident investigation, search and rescue activities and fire prevention.

Depending on the configuration, the light and compact hand-held FLIR HF enables users to see objects over distances of between 400 metres and 1.2 kilometres, which is particularly useful when fighting large-scale industrial, wildfires or maritime fires and generally in search and rescue work. It requires no light to provide a crisp 320 pixel by 240 pixel image on which the smallest details can be seen without the need for adjustment. It also enables the firefighter to see through smoke and take temperature measurements.

Features include a spot temperature measurement meter that shows the temperature at the centre of the image. If this exceeds 150°C, the top part of temperature scale turns red, giving an instant indication that further steps need to be taken to extinguish the fire. The camera is fully controlled via just five buttons.

Four models are available, each with different performance features. The standard package comprises the camera, four rechargeable batteries, hot-shoe charging and video output attachment, car power adaptor, video output cable, AC charger, lanyard and manual.

For more information, go to www.flir.com.au

USAR versatility

A new victim location camera has been launched by CON-SPACE COMMUNICATIONS. The new SearchCam 3000 is claimed to be a new concept in a urban search and rescue cameras; one that can also be used for vehicle extrication, in shafts, underwater or for fire investigation.

The camera is powered by lithium ion battery sticks, which are interchangeable with the Delsar LifeDetector batteries. The Video Display Unit (VDU) is attached to a power module via a mechanical quick-disconnect and the coiled cable allows for the VDU to be held up to two meters away from the power module. The 240 degree articulating camera has built-in audio and provides rescuers with the

ability to see and communicate with trapped victims. A clutch-equipped gear box protects the motor and the gears from damage during use.

The quick disconnect feature provides rescuers with imaging flexibility; a full-resolution colour camera with LED lighting, or black-and-white imaging with infrared lighting. The camera can be lowered into dusty, harsh and wet void spaces, providing teams with a clear well-lit view of the search area. With the environmental sleeve installed, the camera head can be submerged in water up to 23 meters deep, and interchangeable tube sets allow the extension of the camera to reach between 3.38 metres and 5.66 metres. Files from the SearchCam can be uploaded to a computer for playback, archive and search review purposes.

For more information go to www.con-space.com





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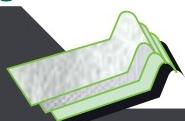
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Andy Watts

Virtua UK

Effective Communication Saves Lives

The quality and speed of communication can mean the difference between life and death. For the emergency services, anything less than one hundred percent technical reliability will not do.

The news over the last few weeks has been dominated by the catastrophic earthquake and subsequent tsunami that has devastated northern Japan. Our TV screens have been filled with distressing scenes of cities and communities being wiped off the face of the map and worrying levels of radiation leaks from damaged nuclear power stations. Even the normally efficient and well prepared Japanese emergency services were caught off guard by the severity of the earthquake. Nothing could have prepared them for the scale of the damage inflicted on the country's infrastructure and it will take many years to recover from the destruction and rebuild shattered communities. It is at times such as these that

the quality and speed of communication can mean the difference between life and death.

Over many years the emergency services have come to realise that in any form of natural disaster or crisis, effective communication becomes paramount. Something as simple as the temporary loss of a phone signal or a poor quality phone reception, with lots of background noise or interference, can lose vital seconds at a time when every second counts.

Although communications technology has globally become a fundamental tool for commercial and business use, it is within the emergency services that one hundred percent technical reliability has become the target, because anything less can put lives at risk.

COMMUNICATION SYSTEMS

The fire service, for example, requires constant access to high quality communications in order to perform its daily duties and it is an essential service that touches all aspects of its work. At such times there is a total reliance on high quality communications systems that serve to connect the team on the ground with the station and other nearby emergency services. Even a vital few seconds can mean the difference between a life saved or lost.

Early options

Over the last hundred years or so we have witnessed staggering advances in communications technology among the emergency services. This has taken us from the humble police whistle of the Victorian 'peelers' and hand-rung fire bells, to the sophisticated radio phones in use today. This ability to communicate effectively during times of crisis or disaster is not just about co-ordinating life saving resources though; it is also about having a reliable mechanism for two-way information flow. Over the years a variety of different communication systems have been developed and deployed. Inevitably some were found to be much more effective than others. In particular the following devices have all been useful to varying degrees:

- VHF radios.
- Walkie-talkie sets.
- Solar or 'hand cranked' radios.
- Single sideband radios.
- "Ham" radios.
- "Citizens Band" (CB) radio.

- "Communications Receiver". This is the "listening" half of a single sideband/ham radio.
- Family Service Radio (FRS).

Each of the above communication systems has proved to be useful in their time and many are still used by hobbyists and enthusiasts. When it comes to fire and the other emergency services though, the sophistication and reliability of any communications tool needs to be of a different order of magnitude.

Changing landscape

These days we all expect good quality phone reception and it is always frustrating when we find ourselves somewhere with a poor signal. But while a good and clear signal is desirable it is not always critical. For the emergency services though it is reliability and interoperability that are the key system design factors when it comes to building resilient communication systems. Any information received via emergency services communications systems needs to be efficiently delivered to the desired first responder person in real time and to a wide range of devices, both fixed and mobile.

But it is not just clear and reliable signals that are desirable. Any integrated information and communication technology (ICT) system for mission-critical, multi-agency emergency services use also needs to be secured from eavesdroppers or would-be interceptors. And this is achieved through the use of sophisticated encryption techniques.

Mobile and integrated communications control systems (ICCS) for use by the emergency services

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and civil contingency responders are increasingly based on next generation, IP-based technology and application platforms. These technical solutions have been specifically designed to inter-connect with a number of tiers of command – at strategic, tactical and operational levels. It is the same, regardless of which type of network they are operating within whether it is TETRA, TDM, SIP or UDP/RTP.

It was the unprecedented and catastrophic attack in New York on 11th September 2001 though, that changed forever our perceptions about communications systems. This world-changing event was a severe test for all the emergency and security services across the length and breadth of New York. And for the overstretched police force it highlighted the crucial need for reliable and seamless communications that could span a wide variety of organisations and functions.

In particular, two specific lessons were learned from the experiences in New York on 9/11. The primary lesson learned from the disaster was the way in which broadband communications could improve the overall effectiveness of the emergency services. The ability of the “first on the scene” responders to send back pictures of the situation, or for those in control centres to see instantly the scale or nature of particular incidents proved to be a critical advantage when dealing with any form of emergency.

**Any information received via
emergency services
communications systems
needs to be efficiently
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responder person in real time
and to a wide range of devices,
both fixed and mobile.**

Secondly, the importance of different emergency and security services being able to communicate seamlessly with each other became a key requirement in terms of the speed and effectiveness of the actions taken. It became abundantly clear that an integrated system is essential if there is to be a high level strategy and co-ordination between the individual security and emergency services. In other words in order to effectively plan and deploy resources with minimum delay, constant communication is essential.

But, particularly in these days of international terrorism, high quality communication is not just the preserve of the Police, Fire, Ambulance and military services. There are many other public and private service operators such as H.M. Coastguard, security organisations and helicopter services etc that can also benefit from being part of an integrated communications system.

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the issues and requirements related to building and deploying the very highest quality communications solutions in the world. We recognise that the systems we are designing are those that the fire and rescue services will be totally relying on in order to carry out their operational duties. Our job is to make sure that the communications technology we create is optimally designed to meet the needs of all its users.

Critical issues

There are a number of critical design factors that need to be considered when creating telecommunications solutions and one of the most important elements is the performance of the network.

Network management is the set of functions that protect telecommunications networks and systems from unauthorised access by persons, malicious acts, or untoward external influences. The design can include many sub-functions, such as creating, deleting, and controlling security services and mechanisms; distributing security-relevant information; reporting security-relevant events; controlling the distribution of cryptographic keying material and authorising subscriber access, rights, and privileges. Also, spectrum allocations can take considerable time to set up so it is essential that the correct design requirements and features are defined accurately.

Also, when it comes to testing security and emergency services communication systems, it is important to emulate real world situations as closely as possible. For example, actually making test calls from real emergency vehicles rather than trying to create artificial situations. This means that the team selected to undertake the tests need to be not only technically competent, but they must also possess the essential diplomatic and social skills to interact with many different people.

New horizons

Today, increased technical innovation is pushing forward the boundaries of what can be achieved to assist the emergency services in ways that were not even conceived of ten years ago. New partnerships are springing up and technologies that were once disparate are now being linked together to

create new synergies. For example, the Microbus LINX is a new demountable tablet PC that has been developed for front-line emergency services vehicles. After initial testing by the Warwickshire police force in the UK it is now in use by all of Qatar's Emergency Services. Not only does it provide high quality communication between the central control room and roving vehicles, the small tablet console can be either mounted in the vehicle or carried by hand to incidents.

In other new applications being tested by the fire service an alarm signal received by a fire station has been set up so as to automatically open the fire station doors, turn on lights, start exhaust extraction fans and even change the traffic lights outside the fire station to enable a quick exit.

Similarly, the new advanced capabilities of TETRA technology, which is the public safety technology solution of choice for governments all over the world, have been tested and deployed within not just the emergency services but also in defence and security services. With high speed data capabilities and high quality imaging the Tetra applications have also been utilised by border control agencies. With the TETRA technology an image or photo of anything suspicious can be broadcast to on-foot patrols within seconds. Used extensively within the oil and gas industry as well as for transport and travel it is also being prepared for public safety use at the 2012 Olympics.

In more niche environments, communications technology is being used to scan and identify personal possessions like bicycles and laptops that are having significant success with local police forces in pilot areas of the UK. In some cases it is helping reduce burglaries by up to 80%. The UK's North West Air Ambulance Services are improving their response rates and life-saving capabilities in mountain rescue operations with the help of a new hand portable radio and integrated GPS system. This helicopter-based radio enables rescuers to communicate and coordinate with the other emergency services in ways that are reducing rescue times.

Other applications include crime scenes solutions where a new forensic extraction device is able to instantly extract detailed 'hidden' information from thousands of different mobile devices and transmit data instantly back to incident control.

These are just a few examples of new communications mechanisms that are changing the way the emergency services communicate. Whatever the situation, whether it be putting a police officer instantly in touch with the fire service or connecting a police officer to a central criminal record database, a reliable and clear means of instant communication is essential. And, no doubt, the sophistication of communications technology will continue to evolve as new technical innovations reach the market.

Our job, as Telecoms professionals, is to ensure that everything works in the most seamless way possible by designing, building, testing and proving the technology. At the end of the day the effectiveness of any communications system can only be measured by proving its worth in real life emergencies. The solutions we create must be reliable, robust, fit for purpose and made available to the people that need it most, when they need it most. Good communication can really be the difference between life and death and it is our duty to get it right.

Andy Watts is Chief Executive at Virtua UK Ltd

For further information, go to www.virtua.uk.com

Dear Sirs,

Thank you very much for your thoughtful expression of sympathy on the very occasion of the strongest earthquake and Tsunami on record we have ever experienced in Japan.

Fortunately we can say we have suffered no loss at all. However, the earthquake and Tsunami in the northeastern area of Japan on 11th May 2011 was so strong that a huge number of people succumbed to it.

We are trying our best to help fire departments and their rescue workers through all possible channels for the safety and comfort of victims. Though we have a hard time for a considerable period of time until we return to normal, we hope we will be able to put such hard times behind us as soon as possible.

Once again we want to thank you for your kind words and your lasting patronage.

Best wishes,



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Graham Collins

Special Application Firefighting Vehicles

As firefighting becomes ever more sophisticated, so the demand increases for ever more specialised firefighting vehicles. Here we review a few of the latest to come onto the market and see what the future may hold.

Wildland Pumper

FERRARA FIRE APPARATUS recently delivered an urban-wildland interface pumper to San Diego County (California) Rural Fire Protection District. The vehicle is designed to protect communities that face threats from not only typical structural fires, but also from the fast moving wildland fires common in Southern California.

The truck is built on Ferrara's Igniter custom fire chassis and has a compact wheelbase of only 4.22 metres, making it specially suited to manoeuvre the tight streets found within its district. This wheelbase is approximately 20% shorter than a typical US structural pumper; the overall length of the entire vehicle is less than 8.23 metres.

While the truck is built on a compact frame, it carries a 1900 litre water tank and full height 183-centimetre compartments on both sides. A ground ladder



compartment in the hose bed carries a 7.3-meter extension ladder, a 3.7-meter roof ladder and a 3-meter folding ladder. The body is built from heavy-duty aluminium extrusions and the same 4.76-millimetre thick aluminium plate found in the apparatus cab. Both the cab

and body have been vertical-load tested to nearly 30,000 kilos, or roughly three times the weight required by the ECE-R29 standard.

There are two fire pumps on this vehicle. One is midship-mounted and drive-shaft driven, a Hale QMAX rated at over 5600 litres-a-minute. The second pump is an auxiliary unit, a Darley AGE, driven by a separate diesel engine. The pump has a smaller capacity; enough to supply a couple of hand lines. Since it is driven by a separate engine, it works well in a wildland setting where pump and roll is a necessity.

Further firefighting capability is provided by an on-board injection foam system, a FoamPro 2001, supplied by an 80-litre foam tank.

For more information, go to www.ferrarafire.com

Flexible Solutions

PLASTISOL has recently built a superstructure with integrated 4-person crew compartment for a German customer. The structure houses an integrated 1600-litre water tank and a 120-litre foam tank. The rear side of the structure is held as far open as possible to house five roll containers with a total weight of 1800 kilograms of equipment. These containers can be loaded or unloaded using a lifting/loading platform at the rear.

This flexible solution enables fire brigades to choose what tools to take on, and means that tools can be brought closer to the work scene. The superstructure consists of six lockers for all the equipment. A ladder is mounted on the superstructure for access to the roof.

A recent Plastisol development in the UK is the Instant Command

Vehicle. This minibus-type of vehicle is fully equipped to function as a mobile command and control centre that can be driven close to the scene. The company has also developed an air-transportable version of its crash tenders, five of which are now in-build for a large NATO member air force. The truck is designed to be trans-

ported in a Hercules C130 airplane. It has an extreme lightweight composite body and high manoeuvrability both on-road and off-road. It fully complies with ICAO and NFPA standards and can be airborne-ready within the hour.



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Strike and Sting

OSHKOSH AIRPORT PRODUCTS has recently unveiled the new Striker 3000 aircraft rescue and fire fighting (ARFF) vehicle and the new Stinger Q4 Rapid Intervention Vehicle (RIV), both designed for airport and specialised firefighting applications.

According to Oshkosh, the new Striker "delivers innovative fire suppression technology, unmatched chassis performance, advanced safety systems, unsurpassed reliability and durability, and smart design". The Striker 6 x 6 model that was shown recently at FDIC in the USA had all-wheel-drive, TAK-4 all-wheel independent suspension, a 700hp Tier 4i and Euro 5 emissions compliant engine, 7-speed automatic transmission, a 2,366 litres-a-minute roof turret, a 11,350-litre water tank, a 1,900-litre foam tank and a 7,570 litres-a-minute fire pump.

The new Striker offers electronic foam proportioning, a wide selection of bumper turrets and a high-reach extendable turret. It is more than 907 kilogram's lighter than its predecessor to provide



faster acceleration – a full second faster to 50 mph. The vehicle is designed to exceed NFPA requirements for static side slope stability, an exclusive walk-in service port provides easy access to all filters and fluid checks in a single area, and the engine access system allows the entire power pack to be removed from the vehicle for easier maintenance, without involving the water tank.

The Stinger Q4 on show at FDIC featured 4 x 4 all-wheel-drive, a Mattracks rubber track conversion system, a 6.4-litre V8 turbo diesel engine and a tri-agent hydrochem hand line nozzle. The Stinger Q4 is also available with the innovative QuadAgent and Pulse Delivery technologies. The Quad Agent system is capable of delivering four firefighting agents simultaneously, or in any combination. The Pulse Delivery technology allows firefighters to deliver dry chemical powder in a truly "dry" form over 27 metres, more than three times the capability of other dry chemical systems.

For more information, go to www.oshkoshairport.com

Get the Max

E-ONE has announced the launch of eMAX designed, as the name implies for maximum manoeuvrability.

It features a new pump location, a short wheelbase, up to 16.6 cubic metres of storage, low, pre-connected hand-lines and a rear access ladder. E-ONE says that eMAX "allows customers to store equipment for fire, rescue, and EMS without sacrificing tank size, pumping capability, or wheelbase".

For more information, go to www.e-one.com



Fighting Freight Fires



ROSENBAUER has supplied sophisticated foam appliances fitted with a Stinger to the fire brigade of a northern European sea port. The specific purpose is to pierce freight containers to extinguish the fire inside, without exposing the firefighters to the danger of a back draft when opening the container doors.

The firefighting power can be enhanced by a Rosenbauer CAF system. Compressed air foam can be made available for all discharge outlets – self protection nozzles, bumper turret and the high volume roof turret – improving the throw, foam stability, burn-back properties and stickiness.

For more information, go to www.rosenbauer.com

Customised Solutions

IVECO MAGIRUS has recently announced a whole clutch of special application vehicles, including a new rescue vehicle with a crane to provide technical assistance and support rescue operations in Bellinzona in Switzerland, and special refinery firefighting vehicles for Beijing-based Petro China, for use at a new oil field in Chad in Central Africa. The German-based company is also reporting considerable interest in compact tank pumper vehicles that, in addition to being suitable for the usual firefighting operations, are also designed for fighting forest fires and bush fires or any other off-road firefighting operations.

The Swiss heavy rescue vehicle is described by Iveco Magirus as a "mobile workshop" or a "self-driven working machine". It has a wheelbase of 4.2 metres and a powerful 306 kW engine, ideal for the mountainous and often



extreme topography around Bellinzona. The driver's cab offers plenty of room for three firefighters. Its most important special feature is a powerful and fully hydraulic loading crane fitted at the rear of the vehicle. This has a lift moment of 119 kNm at 12.1 metres, a hydraulic range of

14.8 metres with fivefold extension and a swivelling range of 420 degrees. It can be remote-controlled by radio and is provided with a headlight at the crane end as well as a rope winch on the crane.

Two of the three oil refinery vehicles for Chad are special firefighting vehicles, each with a capacity of 6,000 litres of water and 6,000 litres of foam, while the third vehicle has a capacity of 3,000 litres of water and 5,000 litres of foam compound. A powerful two-stage normal pressure fire extinguishing centrifugal Magirus FPN 10-6000 pump

is installed permanently in the rear of each of the two larger capacity vehicles, and a Magirus MPN 700 is installed in the third vehicle.

For more information, go to www.iveco.magirus.net

Looking ahead

According to Bardo Govaarts, Design Manager at Plastisol: "The tendency over the past 15 years has been to evolve to more standardised products. Nowadays new strategies and firefighting approaches are demanding more special purpose vehicles, and the variety of vehicle types is growing where fire brigades are trying to combine several functions and applications."

Paul Christiansen, Marketing Director and Aerial Product Manager at Ferrara Fire Apparatus believes that while it is difficult to predict the future with one hundred per cent accuracy, he does see trends in the marketplace toward higher quality and improved firefighter safety.

He said; "As fire departments have to stretch their budgets further and learn how to do more with less money, we see them asking for higher quality in their apparatus purchases to insure their vehicles will have a longer service life. Thicker, stronger components are being used to build fire apparatus, which is also improving firefighter safety."

"Other firefighter safety issues addressed in Ferrara's designs include lowered step heights that provide for safer, easier entry and egress from our apparatus cab." He continued. "We have also lowered the compartment floors to make it easier for firefighters to retrieve



heavy equipment. Pre-connected attack lines are also being lowered, and we now frequently put these on top of the chassis frame instead of above the pump compartment so firefighters no longer have to climb to the top of the vehicle to deploy or reload these attack lines. Rather, they can do this while standing on the street."

Wolfram Mücke, Head of International Sales at Rosenbauer Airports sees more and more recognition for the need of adding specialised escape stairs on ARFF vehicles. He cites the mass evacuation of the Qantas Airbus A 380 after the emergency landing in Singapore in November 2010 as proven the importance of having such units available.

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DX1026*	Anionic	●	●	●	●
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Safeguarding Washington Dulles



Jason Gruber

Metropolitan Washington Airports Authority

Sitting twenty six miles west of the US Capital, Washington Dulles International Airport is one of the first places that domestic and international travelers see when coming to Washington, D.C.

The Metropolitan Washington Airports Authority (MWAA) was formed in 1987 and comprises Ronald Reagan Washington National (DCA) and Washington Dulles International (IAD) Airports. Reagan and Dulles were two of the last three airports that were federally operated and are now operated by the Airports Authority under a lease from the federal government.

In 2010, Washington Dulles (an Index E airport) and Ronald Reagan National (an Index C airport) Airports served over 41 million passengers to and from the nation's capital. Dulles served over 23 million passengers while National served 18 million. If both airports were counted as one airport, the Washington area would rank as one of the busiest airports in the world. The Fire and Rescue Department fall under the authority's Public Safety Division.

The Fire and Rescue Department for MWAA is led by a Fire Chief, with two Assistant Fire Chiefs (one for emergency services and one for support services) and three Deputy Fire Chiefs (one for Dulles Airport, one for National Airport and one for the Code Enforcement Division). The depart-

ment also has nine Battalion Chiefs (three at Dulles, three at National, one for Safety and Training Division, one for EMS, and one for Special Operations).

The Fire and Rescue Department consists of 153 sworn members of which 84 are assigned to fire operations at Dulles and 45 are assigned to Reagan.

Washington Dulles International Airport

Located in Northern Virginia, Dulles sits on approximately 4,856 hectares on the western edge of Fairfax County and eastern edge of Loudoun County. As with most airports, the area is under a large growth of residential and commercial occupancies; at one point, Loudoun County was the second fastest growing county in the United States.

The airport has four runways that accommodate over 1,000 movements every day. There are three parallel runways and a cross-wind runway. Two are 3,350 metres long and 46 metres wide; one is 2,865 metres long, and another is 3,200



metres long and 46 metres wide. The Airbus 380 will have no problem maneuvering around Dulles as was evidenced in March of 2007 when the aircraft made its inaugural visit to the US Capital. In fact, Dulles was the first airport built with consideration to commercial jets.

Dulles has one main terminal, five passenger concourses and 143 aircraft gates. In early 2010, the airport opened an underground train system. This AeroTrain moves the passengers from the main terminal to the concourses. Prior to the opening the AeroTrain system, passengers were moved to the concourses via an underground walkway or by Mobile Lounges, large rubber tired vehicles. These mobile lounges are still in service but on a limited role.

Fire and Rescue Department at Dulles Airport

With over 12,000 acres, Dulles has three fire stations to provide coverage. One is positioned at the south side of the airfield and was opened in 2002. This station contains 13 personnel and is the primary response to airfield emergencies. The station houses two staffed ARFF units, each with two personnel, the operation's battalion chief, a Quint tower truck with four personnel, an ALS transport unit with two personnel, and a twin agent unit. In addition, the station houses a foam trailer, a medical care support unit, a special operations unit and a tunnel rescue van. The station also houses two reserve ARFF units and a ready reserve ALS transport unit.

Another station is located on the north side of the airport, street side. This station opened in 1996 with primary responsibilities for street-side responses as well as secondary responses to the airfield. It houses a structural engine staffed with four personnel, an EMS supervisor, an ALS transport unit staffed with two personnel and a ready

reserve engine. It is the primary office location for the Code Enforcement Division.

The third station is the newest and was built for the expansion of the west side of the airport. It opened in November of 2008 and houses two foam units each staffed with two personnel. The station contains five apparatus bays for future growth of the airport. The main purpose of this station is to serve the new runway area, but personnel also respond to all points on the airfield. This station is also home to the deputy fire chief of Dulles, the battalion chief of Special Operations and the captain of Safety and Training for Dulles Airport.

In addition to airport and airfield responses, personnel from all three stations respond off the airport to assist the fire departments of Loudoun and Fairfax Counties. This includes both the ARFF and EMS/structural apparatus.

Last year, personnel responded to over 3,500 calls at Dulles.

Current projects

One capital construction project that has been under way for the last decade is known as D² or Dulles Development. This project has already produced new parking garages and a new, taller air traffic control tower, new runway and associated taxiways, an extension to the B concourse, underground train system and an expansion of the facilities for arriving international travelers. An expansion to the cargo buildings and new midfield terminal are planned.

Similar to Denver, Dulles has an airport access road that links Washington DC and the Capital Beltway with Dulles Airport. The sixteen mile Dulles Access road is owned and maintained by MWAA and is for airport traffic and service providers. Recently, MWAA has taken over operation of the Dulles Toll Road (which runs parallel to the Dulles Access Road) as part of the program to



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bring the metro rail (Washington, DC subway transit system) to Dulles Airport and beyond. The revenue from the Dulles Toll Road will partially fund the ongoing construction of the Metrorail in the Dulles Corridor. The Metro construction is expected to be completed by 2017.

Training facility

All MWAA firefighters are required to participate in a live burn every calendar year. In 1997, a live fire training facility was opened at Dulles to accommodate these burns for both airports. Training is conducted by members of the Safety and Training Division. The facility contains a 38-metre radius fuel spill trainer with a mock up 737 in the centre and a variety of other training props.

Ronald Reagan National Airport

Ronald Reagan National Airport sits across the US Capital in Arlington County, Virginia. The airport first opened its doors in 1941 after three years of construction. Ronald Reagan National Airport sits on 880 acres on the west bank of the Potomac River.

The airport has three runways that accommodate over 500 movements a day. They are 2,094 metres long, 1,586 metres long and 1,497 metres long. There are three passenger terminals for air carrier operations. Terminal A is the historical, original terminal that was built in 1941, which is undergoing refurbishment. Terminals B and C were built in 1997 and contain the majority of the airline gates.



Fire and Rescue Department at Ronald Reagan National

The Fire & Rescue Department at Reagan moved into a new fire station in November of 2008 and sits to the West, just south of the middle of the airfield. The station has six drive-through bays with the capability of apparatus to respond on both sides of the station (crash on the airfield side and structure on the street side). The station houses the operations battalion chief, two ARFF Units with two personnel each, one engine staffed with

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ARFF PROFILE



four personnel, one ALS transport unit staffed with two personnel, and an EMS supervisor. A medical care support unit, mobile command post and a Hazmat unit are also cross-staffed as necessary. The station also houses a ready reserve engine, foam unit and an ALS transport unit.

The airport also has two boat houses for the rapid launch of boats in the event of an aircraft emergency in the water. There are three full time employees assigned to the River Rescue Division and firefighters from Ronald Reagan National provide supplemental staffing for the river rescue personnel. The station also is home to the deputy fire chief for Ronald Reagan National, the battalion chief of Safety and Training and the captain of Safety and Training. In addition to the airport responses, personnel and apparatus from the airport provide assistance off the airport into Arlington County, City of Alexandria and the District of Columbia.

Current projects

A majority of the larger projects at Ronald Reagan National have been completed and because of the limited land at the airport, no large expansions are planned. The construction of a new level on the parking garage was completed in 2010.

In June of 2009, a new Public Safety Communication Center opened at Ronald Reagan National. The facility is capable of functioning as a Primary 911 call taking facility and handles emergency and non-emergency communications for the MWAA Public Safety Division between both airports. The center uses state-of-the-art technology including a computer-aided dispatch system, ANI/AI/1 telephone system, fire and AED alarm monitoring and monitoring capability of all of the thousands of CCTV cameras for both airports. The center contains multiple positions for 911 call taking and dispatching duties in addition to a fully automated EOC, training module and conference room. **IFF**

Jason Gruber is Captain – Safety & Training Division, Metropolitan Washington Airports Authority Fire & Rescue Department – Aircraft Rescue Firefighting Washington Dulles International Airport

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Colombian Firefighter Training

The latest phase of an educational partnership between the Colombian Fire Service and the UK's Devon & Somerset Fire & Rescue Service (DSFRS) took place recently in the Colombian capital city of Bogota.

Paul Furler

Devon & Somerset Fire & Rescue Service

Officers from the UK Fire Service have been working with colleagues in various regions of Colombia to improve their firefighters' safety for over 15 years, recently in the region of Caldas and Bogota with the emphasis being on breathing apparatus training.

Following a course in the UK in 2009 attended by officers from the Bogota fire department, a team from DSFRS travelled to Colombia to assist with the construction of a fire behaviour and compartment firefighting training facility and to provide additional Instructor training in the city.

The Instructors from Bogota received an initial four-week Instructor training course in fire behaviour and compartment firefighting techniques at the DSFRS breathing apparatus and fire behaviour training centre at Exeter in the UK to enable them to provide their own facility in Bogota and provide training for the city's firefighters in the future.

The Bogota Fire Department is currently in the process of constructing a new training centre for its 500 firefighters and it was hoped that this

process would be far enough forward to enable the compartment fire training unit to be constructed on this new site. Instead, a temporary site was utilised at the rear of the city's Puenta Aranda fire station.

Construction phase

The UK team produced a list of parts that could be produced prior to the teams' arrival in Colombia, and supervised a demonstration and attack container, scheduled to be constructed during the first two weeks. Two shipping containers were sourced, the first of which was in place on our arrival at the site, along with the majority of the prefabricated components, and the second was craned into place at the end of the first week's construction.

Bogota fire department had engaged the services of a local engineering and welding contractor to produce the components and carry out much of the construction process and so, with the UK team and its help, this phase of the project was completed on the Friday of the second week.



Training Phase 1 – Bogota Instructor Skills Refreshment

Although the Bogota Instructors had reached a good standard in Devon during September 2009, they were the first to admit that without the benefit of a fire behaviour unit back in Bogota on which to practice their skills they would need to be refreshed before they would feel competent to train students.

Hence, the second ‘training’ phase was designed specifically to enable the instructors who would be running the initial courses for their Bogota firefighters to gain as much experience as possible, with the benefit of the UK team and our colleagues from Manizales. We were issued with BA sets and items of PPE that we were unable to carry from the UK, carried out the relevant acceptance tests prior to use, and reminded our colleagues that we expected to see this practice continued by all course participants during training. BA log books had been translated into Spanish for use in Bogota prior to our arrival so that records of the tests could be maintained.

Training commenced with the instructors taking turns as lead instructor to carry out two burns each day and lectures on all the relevant theory for the third full week under the watchful eyes of members of the Devon team. The burns were organised so that all the instructors were refreshed on the skills to safely take charge of Demo, Attack 1 and Attack 2 sessions. The Bogota instructors’ ingenuity became apparent during this first training week when they produced a Colombian version of the ‘Bang Box’ that they had witnessed in operation in the UK, although the electrical safety of the unit was initially somewhat questionable.

During this intense period the instructors were subject to an additional steep learning curve regarding the necessary provision of the logistics required to enable a training establishment to run efficiently and safely. At the beginning of this

process, we were introduced to their Colombian BA training support officer who was also party to the learning curve of expertise in logistical provision for a busy training site, much of which I still believe was lost in translation!

The week of training culminated in an Attack 3 session utilising the swinging partition to demonstrate the flexible design of the Attack container to carry out search and rescue drills in addition to being a training platform for compartment fire fighting.

Training Phase 2 – Potential Assistant Instructor Training

The chief officer of Bogota and his chief training Officer had suggested at the initial briefing on our first day in Colombia that they would like ultimately to train a number of assistant fire behaviour instructors during the final two full weeks of our visit. These assistant instructors would then be in place to provide support for the qualified instructors when they commence training their firefighters in earnest after our departure.

Our initial reluctance to this concept was based purely on safety, and we explained that we would not be happy to encourage a situation where an assistant instructor could potentially run a training session for students in a container without the attendance of a fully competent instructor.

It was then further explained that the CFO’s intention would be to send suitable candidates from this two week course to the UK to receive a full FBI course within the next twelve months, subject to capacity at DSFRS BA Academy in Devon.

On that basis it was agreed that we would continue to train eight assistant instructors to as high a standard as time would allow and that they would continue their education during the ensuing months assisting with the Bogota fire fighter courses.

On the first working day of the week we were



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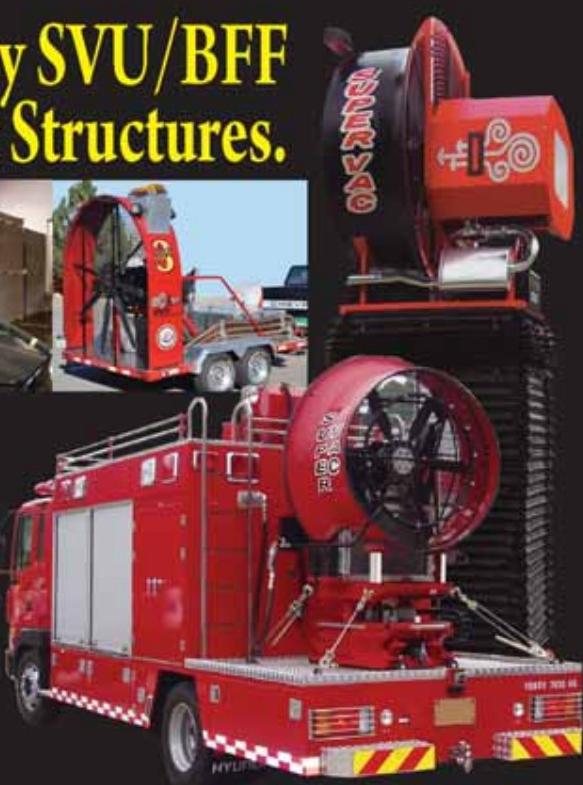


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introduced to the 12 potential instructors who were of varying ages and operational backgrounds. Most were not used to wearing breathing apparatus on a regular basis and were certainly not familiar with the UK safety procedures that we insisted upon during training delivered by us.

The Bogota FBI's had delivered a pre-course day of familiarisation training for the candidates during week two of our construction phase that included BA set servicing and testing procedure, a fresh air wear to demonstrate the varying air consumption of the candidates while walking at approximately 4 miles-an-hour. This was interspersed with periods of arduous work and followed by an entrapped procedure exercise.

It was decided that the first week of the assistant instructor training would involve the Bogota FBI's delivering the content of an initial fire behaviour and compartment firefighting course with the candidates acting as recruit firefighters. From this initial group it was hoped that eight suitable candidates would be found to progress to the second week and ultimately demonstrate their potential to be Instructors in their own right.

Theory, branch techniques, Demo, Attack 1 and Attack 2 sessions were run through the week with a number of interruptions as a result the attendance of the city and national media that were extremely interested in our activities. After consultation with our Colombian colleagues at the end of the week there were clearly eight candidates that were of the required standard and were duly invited to attend the final week of training.

Training Phase 3 – Assistant Instructor Training

The final week of training was cut short to four days due to the opening of a new fire station for the north of the City.

The final phase of training started with the allocation of syndicate work for the remaining eight candidates in the form of practical sessions and lectures that would be delivered on the final

day of training. Eight burns were scheduled for the remaining days to include the logistics for those sessions and one on one mentoring for each candidate at each stage of training.

The eight candidates proved throughout the week that they had been well chosen with enthusiasm and acquired knowledge of the subject matter being more and more evident as the week progressed. The only consistent problem that caused us concern was the inability by most to master the branch techniques correctly, but as soon as better branches were found and the appliance water tank flushed through with cleaner water, even this improved beyond recognition.

After a practical door entry training session the week culminated in a demonstration for the assistant instructors of an Attack 3 session, with the Bogota FBI's running the session under the guidance of the Devon Instructors. It was felt that, although we have always advocated a 'don't run before you can walk' ethos, it was important that our colleagues should experience the full potential of the training containers, understand the next stage of the process with regard to back-draft prevention and recognise the signs and symptoms of the phenomena first hand but under controlled conditions.

An official debrief was held during the final days of the visit followed by the certification of the fire behaviour instructors and the assistant fire behaviour Instructors. The continued educational collaboration between DSFRS and the Colombian Fire Service was confirmed on the return of the UK instructors to England with the next stage of the project receiving the approval of Devon & Somerset's chief fire officer. The intention is that the assistant FBI's will travel to the UK to attend a fire behaviour and compartment firefighting instructor course at the DSFRS Training Academy at Exeter during 2011. Meanwhile, the first firefighter awareness courses have been run at the training facility in Bogota and have been received extremely enthusiastically by their students. **IFF**

Paul Furler is with the
Devon & Somerset Fire &
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The Pressure to



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When it comes to a hazmat suit, confidence comes with a better understanding the engineering and dynamics of air pressure within your hazmat suit.

In the fleeting moments while donning a hazmat suit during an emergency situation, it is natural for first responders to feel a sense of anxiety. A host of questions can enter the first responder's mind while preparing to combat both known and unknown chemicals in a hazmat suit. Will I be able to manoeuvre myself effectively in this suit? How can I be sure the exhaust valves in my suit are working properly? How often does my suit need to be pressure tested?

The answers to these questions lie in understanding the engineering behind your protective garment. While each protective garment is engineered differently, a lot can be understood about the properties and performance of your suit through examining its exhaust valves. Taking the time to consider a suit's valves will not only help first responders to select a hazmat suit, but ultimately provide peace of mind to them when in the hot zone.

What's the pressure?

For the purpose of this article, we will examine Level A suits, which are built for chemical and gas protection, using a self-contained breathing apparatus (SCBA) for respiration. These suits can be engineered to slightly inflate using the air that is exhaled through the SCBA. The user's exhalation pressurises the suit, creating a comfortable distance between the emergency responder and the material of the suit. Ultimately, this design makes the suit more comfortable by decreasing the impact of the suit's weight on the head, shoulders and mask, which increases user mobility. While inside a suit that is slightly inflated, first responders are more easily able to withdraw their hands for access to radios, gauges, and cloth for wiping a potentially fogged visor.

It is important to note that internal air pressure levels can vary by suit design and manufacturer. The best way to test your suit is by trying it on and

Perform

checking that there is a comfortable space between your body and the suit's material.

The potential for user-error

To further understand the dynamics of air pressure within your suit, take time to examine your suit's exhaust valves. There are several types of technology on the market. The most common exhaust valve systems employ a small diaphragm that seats against a set of holes to regulate airflow and prevent leakage of air from outside of the suit. This system, while effective, requires diligent maintenance.

Maintenance entails manually dismantling and reassembling each valve to be inspected and pressure tested. This technology should be used with caution, as it leaves the potential for user error during the process, posing the threat of inadvertently damaging the valve's diaphragm during testing or reassembling it incorrectly. There is typically no way to accurately verify that the valve has been reassembled correctly and will function as intended during use. This clearly poses a risk, as the first responder's protection against inward leakage and harmful gases could be compromised.

**Maintenance entails
manually dismantling and
reassembling each valve
to be inspected and
pressure tested.**

To mitigate this risk, it is important to look for hazmat suits with exhaust valves that cannot be disassembled and do not require maintenance. Consider suits that incorporate valves of a completely sealed design. Servicing is not required on closed construction valves, rendering them tamper proof. To be sure your valve is tamper proof, look for a closed construction and verify with your hazmat suit manufacturer that their exhaust valves are 100% factory tested against inward leakage and outward flow.

Check out those valves

Once you have determined the construction of your valve, take time to examine the material from which the valve is constructed. Valve diaphragms can consist of silicone or more traditional rubber, for example, butyl, which can cause a difference in shelf life and performance.

Depending on storage conditions, diaphragms made from traditional rubber can become compromised. Extreme temperature fluctuations and dry conditions increase that risk, over time making the valve diaphragms susceptible to cracking. For a more reliable alternative, consider exhaust valves that utilise silicone rubber diaphragms. Silicone is a strong, highly inert polymer, resistant to the effects of environmental exposure. It can be difficult to visually confirm your valve's diaphragm material, so be sure to check with the suit manufacturer for specific information.



Pressure testing

Even with the highest quality exhaust valves, it is crucial to ensure your hazmat suit is ready for use through routine pressure testing. Requirements for pressure testing are specified through the NFPA 1991 standard. Suits certified to NFPA 1991 must be tested annually or after each time the suit is used – whichever comes first. It is important to point out that exhaust valves requiring disassembly for pressure testing present risk for damaging the valve diaphragm's integrity through user error. To avoid this risk, look for a suit that utilises permanently sealed construction valves – they will not need to be disassembled for pressure testing.

In addition, some models of exhaust valves, often those with traditional rubber diaphragms, require that the diaphragm be replaced every two years due to manufacturer specifications. This contributes to added maintenance and logistics during the suit's lifecycle. Be sure to check if the suit you own or are looking to purchase has such requirements.

Sealing it all in

While physically a small component of your suit, you can see how exhaust valves are a critical component to your performance, comfort, and ultimate safety while in the hot zone. Whether you are looking to purchase a new hazmat suit, or donning an old favourite, understanding the dynamics of your suit should provide peace of mind, which is something every first responder deserves.

Peter Kirk is Market Manager at Saint-Gobain Performance Plastics

For further information, go to www.protectivesystems.saint-gobain.com

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Selecting the Right Proportioner



Keith Klassen

Waterous

Today's market is flooded with a wide variety of foam proportioners. They have different methods of operation and some are more appropriate than others for certain situations. However they all have a common purpose – to create foam solution in the correct percentage.

Foam solution is simply a mixture of foam concentrate and water and the percentage of foam solution required will vary according to the type of concentrate used and the tactical objective when using the product. Class A concentrates are designed to be used on fires involving ordinary combustibles, and are typically used in percentages of 0.1% to 1.0%. Varying the percentage will change the consistency of the finished foam – the combination of foam solution and air that has been agitated to form bubbles. Increasing the percentage will make a stiffer, slightly drier finished foam. More importantly, the increased amount of concentrate will cause the foam bubbles to hold water for a longer period.

Class B concentrates are typically used at 3% or 6% although there are some 1% concentrates on the market. These concentrates are for incidents

involving flammable liquids, and the percentage selected is determined primarily by the product to which it will be applied.

Foam proportioners can be broken into two major categories: manual and automatic.

Manual proportioners require some operator attention to keep them working at the correct percentage as conditions on the incident change. Automatic proportioners sense various parameters and adjust to keep the percentage accurate as conditions change. This makes automatic units much easier to operate, as turning on the proportioner and setting the percentage is normally the only operator input required. There are numerous systems on the market in both of these categories, so here we will examine only the most commonly used methods of proportioning in each category.



Manual proportioners

In the manual proportioner category we will look at batch mixing, educators, and bypass educators.

Batch mixing is the simplest way of creating foam solution and is done by pouring the proper amount of foam concentrate directly into the water tank. For example a 1,000 litre water tank to be mixed at 0.5% would require five litres of foam concentrate. This method is used only if the apparatus has no foam proportioner or, as a 'Plan B', to create foam solution if the existing proportioner becomes inoperable.

Foam eductors come in various sizes depending on the amount of foam solution needed. Eductors may be portable, so that they can be attached to a discharge, or inserted in the hose line. They may also be mounted on the apparatus and plumbed

parameters to operate effectively. For example, the flow through the eductor must match its rating. Incorrect flow will affect the pressure drop through the Venturi and therefore prevent its operation. To ensure the correct flow the eductor must be matched to a correctly adjusted nozzle, which must discharge at a constant rate.

Another factor that will disrupt the eductor's operation is any condition creating 5 psi or greater back-pressure down stream of the eductor. Because flows during the operation must remain constant at the rated litres-a-minute, the use of an eductor is problematic for Class A foam firefighting where lines are constantly being opened and closed. Eductors work much better in Class B operations, where foam is being flowed constantly on a fire or a spill for a longer period of time.

Manual proportioners require some operator attention to keep them working at the correct percentage as conditions on the incident change. Automatic proportioners sense various parameters and adjust to keep the percentage accurate as conditions change.

into the discharge plumbing. Foam eductors operate using the Venturi Principal; the eductor's inlet has a large diameter as compared to the small diameter in the centre or Venturi area of the unit. The outlet of the eductor returns to the original inlet diameter. The result is that all the water entering the eductor is forced through the small centre opening.

In order for this to occur, the velocity of the water must increase as it passes through the small diameter. This increase in velocity reduces pressure in the Venturi area, which allows the foam concentrate to enter the water stream as atmospheric pressure pushes on the concentrate in the foam bucket or tank. This is the same principal by which carburettors provide fuel to engines, and airplane wings create lift. Eductors are typically pumped with a 200-psi inlet pressure. This is due to the high friction loss, roughly 30%, through the small Venturi area.

Foam eductors are situation sensitive, and they must be operated in precisely the correct

Bypass educators work on the same principal, as the educators previously described with one major difference. Instead of the entire water stream passing through the educator, a small portion of the stream is diverted through the educator venturi, where it draws-in the concentrate, creating a foam solution. This solution then returns to mix with the remainder of the stream. The advantage is that bypass educators are much less sensitive to specific pressures, flows, and down-stream back-pressure in order to operate properly. This makes them less situation sensitive and much more user friendly.

Automatic proportioners

Automatic proportioners include balanced bladder, balanced pump proportioners, and electronic direct injection systems.

Balanced proportioner systems provide a method to keep the foam concentrate pressure equal to the water pressure. This can be done by using water pressure to squeeze a bladder



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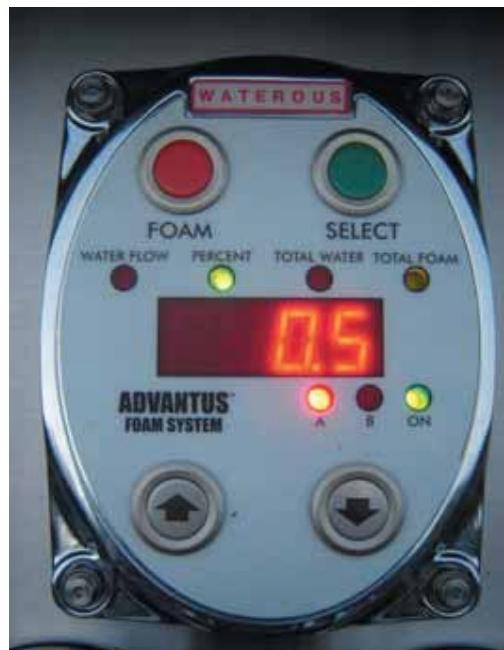
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containing the foam concentrate, or by using a water-driven foam pump. It can also be done by controlling the pressure created by a foam concentrate pump typically driven by an electric motor. Relief valves or diaphragm controls are often used. With the concentrate and water pressures equal a simple pressure differential valve in the foam manifold will allow the concentrate to enter the water stream. The more water that flows through the differential valve, the greater the pressure differential and therefore the more concentrate enters the stream. This keeps the foam solution percentage constant as flows change.

By far the most common most accurate proportioners on the market today are electronic direct-injection systems. As the name implies they are electronically controlled and inject foam concentrate directly into the foam manifold.

These systems sense various parameters to



determine how much concentrate to inject into the water to create the correct percentage foam solution. All systems sense water flow volume, typically using a paddle wheel flow meter; the more water that is flowing, the faster the wheel spins, creating an electronic signal. Some proportioners sense water temperature, which is a factor because it is easier to mix foam concentrate with warm water than cold water. Other proportioners also sense conductivity, as measuring conductivity is an accurate way to check solution percentage. It also can help control the variables inherent in both water and foam concentrates that effect the foam solution produced.

These systems do this by first measuring the conductivity of the water entering the proportioner, then measuring the conductivity of the foam solution exiting the proportioner and comparing the values to ensure that the percentage is correct. The proportioner sensors feed their information to a computer that calculates the volume in foam concentrate to inject. The computer then controls the speed of the injection pump – the faster the pump spins the more concentrate will be injected. The system is a closed loop that is constantly sensing and adjusting, keeping the percentage accurate as lines are opened or closed.

When selecting an electronic direct injection proportioner some careful considerations must be made in order to obtain the system that best fits the fire department's needs. These proportioners come in a variety of sizes measured in foam concentrate litre-a-minute flow capacity. They range from six litres-a-minute on the low end, to over 45 litres-a-minute on the high end. However, bigger is not always better, so size the system to fit the need. There are two factors that determine the need. The first is the volume of foam solution needed; a wildland fire truck that typically flows low volumes will only require a low litre-a-minute proportioner. Over sizing the proportioner in this application causes problems because large systems have decreased low-flow accuracy and at times intermittent low flow operation. A structural

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pumper that may be called upon to flow foam master streams will require much higher concentrate flow capability. This will call for a large capacity proportioner to keep up with the concentrate demand of high water flows.

The second factor is the type of concentrate to be used. As mentioned earlier Class A concentrates are used at low percentages, up to 1%, while Class B concentrates may be used at much higher percentages. The higher the percentage the more volume of concentrate will be required to treat a specific volume of water. For example, when using Class A foam at 0.3% 12 litres of concentrate will treat 4000 litres of water. Using Class B foam at 3.0%, 12 litres of concentrate will treat only 400 litres of water.

There are also some options that should be considered when selecting a proportioner. The first is a dual tank selector.

If more than one type of concentrate will be used they will need to be stored in separate tanks and a selector switch will be needed to switch between them. Tank selector switches are available in both manual and electric versions that have a flush position. This is necessary because Class A and Class B concentrates are not compatible and can gel if mixed. The flush position allows the proportioner to be cleaned before a different concentrate is used.

When selecting a foam proportioner, consider first the mission of the apparatus and the volume and type of foam that will be needed. Then select the system that best fits the need.

A dual tank selector switch can also be used with a single tank and an overboard pick-up. The overboard pick-up provides the ability to switch to a concentrate not normally carried, or to draw from a large supply on a big incident. If specifying an overboard pick-up be certain that the proportioner being used is capable of drafting from the outside source. The second option is a foam refill system. This system consists of a pickup tube, pump, and plumbing to refill the onboard foam tank from ground level. This is highly recommended for firefighter safety as it eliminates the slip trip and fall hazard of climbing on top of the apparatus with foam buckets.

When selecting a foam proportioner consider first the mission of the apparatus and the volume and type of foam that will be needed. Then select the system that fits the need and falls within the fire department's budget limitations. Doing some homework prior to selecting a proportioner eliminates future problems and make the system user friendly. **IFF**

Keith Klassen is CAFS Instructional Program Manager at Waterous

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Floodwater Rescue Right Gear



Cody Harris

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Floodwater poses many dangers to the rescuer. It is a dynamic environment where one small mistake or misjudgement can snowball into catastrophe.

In past years, a third of drowning victims in the United States were would-be rescuers, many of whom lacked either proper training or equipment. So, it is of paramount importance for rescue teams to not only purchase the proper equipment, but also to train and practice in whitewater.

NFPA (National Fire Protection Association) standard 1670 (Standard on operations and training for technical search and rescue incidents) outlines three levels of training for whitewater rescue: awareness; operations; and technician. So, before purchasing any equipment, your agency should decide which level of training you will pursue, as there is a different equipment list for each.

Equipment lists

The awareness level of training is designed for agencies and rescuers who have a minimal exposure to whitewater. Typically, the requirements to reach this level of training are an eight-hour course. Awareness level rescuers will not be entering the water, but may be operating in proximity to the water.

The minimum equipment requirement is:

- Helmet.
- Personal Flotation Device (PFD).
- Proper Footwear.
- Throw-bag.

The operations level of training is designed for agencies and rescuers who will be assisting in-water rescues and could be exposed to accidental swims. Typically, the requirements to reach this level of training are a 16-hour course.

The minimum equipment requirement is:

- Helmet.
- PFD.

- Thermal Protection.
- Proper Footwear.
- Throw-bag.

The technician level of training is designed for agencies and rescuers who will be conducting in-water rescues, either swimming or by boat. Typically, the requirements to reach this level of training are a 24-hour whitewater course and 24-hour technical ropes course.

The minimum equipment requirement is:

- Helmet.
- PFD.
- Thermal Protection.
- Gloves.
- Proper Footwear.
- Throw-bag.

Making the right equipment choices

Helmets:

There are many manufacturers of water sports helmets, each with their own strengths and weaknesses. The most important factor when deciding on a helmet is comfort. An uncomfortable helmet will usually end up unbuckled or taken off. Either way, it will not be doing its job.

After comfort, the helmet should be assessed for coverage. There is an assortment of styles, from full-face to over-the-ears. One of the most important areas of coverage is the forehead, and many helmets will slide back, leaving the forehead exposed. This is not acceptable in white-water.

The final consideration for helmets should be whether or not a skull cap or beanie will fit underneath it. In many countries, rescues occur during spring run-off, when the water is between 1°C and 4°C, so extra warmth is a necessity.

- Getting the

during these rescues. Many helmets allow you to easily adjust the padding inside to accommodate this.

Personal flotation devices:

The U.S. Coast Guard has developed standards for PFDs. It is essential that the PFD chosen is designed for white-water use and is a Type III or V, which will generally provide more flotation. The PFD should fit comfortably on the rescuer and should be snug when adjusted. The typical way of testing this is by pulling the shoulder straps up; if the PFD pulls up the torso and covers the rescuer's chin, then it should be tightened.

A Swiftwater Rescue technician should consider purchasing a rescue PFD. These PFDs come with a quick release harness, allowing the rescuer to perform a tethered swim. However, caution is needed. Tethered swims require training to perform so, if your agency does not have a technician-level rescuer, avoid the purchase of a rescue PFD. This will prevent the misuse of the harness.

All PFDs should have a whistle and knife attached to them, and beware of purchasing a PFD with too many pockets. Although they can be convenient during rescue operations, they can often become a nuisance or entrapment hazard in the water.

Thermal protection:

There are really only two choices here: wetsuit or drysuit.

The benefits of wetsuits are that they are:

- Relatively inexpensive.
- Provide abrasion and impact protection.
- Provide warmth in the water.
- Relatively comfortable.
- Durable.

The weaknesses are that they:

- Do not provide significant warmth out of the water.
- Can be restrictive and increase difficulty with swimming.

The benefits of drysuits are that they:

- Provide maximum warmth in and out of water.
- Are non-restrictive when swimming.
- Provide body substance isolation.
- Provide entire body coverage, with the exception of hands and head.

The weaknesses are that:

- They are expensive.
- Latex gaskets around neck and wrists can be uncomfortable.
- They offer no impact or abrasion protection.
- They can tear and become ineffective in water.

For rescue teams functioning in cold water, the decision is fairly simple. Drysuits provide the maximum amount of thermal protection.



Gloves:

Simple neoprene gloves will protect hands from rope burns and provide warmth. Avoid other materials.

Footwear:

Footwear is the most overlooked, and perhaps most important part of the swiftwater gear. Most injuries on the river occur, not in the water, but on loose, jagged rocks on shore. So, proper footwear should be worn by all members of the rescue team.

There are numerous options for river shoes, most of which are constructed from neoprene. Rescuers must balance foot protection with flexibility for swimming; large lace-up water rescue boots are great for walking and working on shore, but can be difficult when swimming. Thin neoprene booties are great for swimming, but provide little protection for walking.

If swimming fins are a consideration for the rescue team, then assure that the river shoes fit inside the fins.

Throw-bags:

Throw-bags come in varying shapes and sizes, and are made of many different materials.

The minimum length for a rescue team should be between 15 metres and 18 metres of rope. Consider purchasing a more expensive low-stretch rope, such as spectra or dyneema as this will allow the rescuer to use the rope as a tensioning tool if necessary. Technician-level rescuers should consider a belt-bag that fits around the waist, allowing the rescuer to swim while transporting the bag.

Final thoughts

When it comes to swiftwater gear there is a lot of choice. However, it is important that each agency and individual assess carefully the use to which the gear may potentially be put, and choose accordingly. Keep in mind, though, that even the best, most expensive gear is only as good as the rescuer using it. Swiftwater rescue requires training and practice.

Cody Harris is the Director of the Whitewater Rescue Institute

For more information go to www.whitewaterrescue.com

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Angus Fire's Duraline fire hose is certified to AS 2792 and kitemarked to BS 6391. Pic courtesy of Kidde Australia



Choosing the Right Fire Hose

Kidde Australia

There is a perception that fire hoses are all pretty much the same, so why spend much time or money on them? Wrong – there are huge differences.

Many firefighters view that their layflat fire-fighting hoses should be simply bought cheaply and frequently replaced, without any need for detailed performance specifications, except for the burst pressure where the misconception is that the “higher the better” must be right. However, the best can give superb performance and reliability over 20-plus years, even when used frequently. Buying low quality fire hoses is usually nothing more than a false economy.

Hose as a lifeline

Why do we treat our fire hoses as cheap commodities, and is that thinking responsible for those using and trusting these products in life-risking situations? Our firefighters, especially the nozzle operators are potentially at most risk in the face of the fire, by actually fighting it; containing it; preventing further destruction; and most importantly saving lives.

We should see fire hoses as a critical lifeline or umbilical cord, not only keeping our firefighters safe at the end of the line, but also rescuing those in need.

Why fire hoses fail

Fire hose needs to do a tough and difficult job during fire fighting, but it also needs to be stored in immediate readiness for its next emergency. They have the potential to let the firefighter down. Challenges include: the sudden loss of pressure; reduced

water flow; kinking; sudden cuts to jacket or cover; abrasion damage; chemical attack; substantial leaks; sudden bursts; and even insidious attack from ozone in the air during storage. However this is not the fault of the hose, as it is doing no more than performing within its design parameters.

Experience shows that hoses fail often as a consequence of using the wrong product for the job, or not having an adequately robust specification for the hazards they face during use.

Spend time choosing

The choice of fire hose can make a huge difference to the performance, durability and reliability. It can save money over time, and provide outstanding reliability and durability if you select using a rigorous specification like the Australian Standard AS 2792 (Fire hose – Delivery layflat) or in conjunction with the internationally respected BS 6391:2009 (Specification for non-percolating layflat delivery hoses and hose assemblies for fire fighting purposes).

Firstly we have to understand the basics. Layflat fire hoses come in many different sizes and varieties, but there are two basic types:

- **Conventional textile hose with rubber lining:**

This has a woven jacket with the weave visible on the outside of the hose. These are usually white in colour and are generally used in low-risk applica-

HOSES

Ozone cracking on extruded hose. Pic courtesy of Kidde Australia



tions such as: hose cabinets in light industrial areas; Class A hazards; some forestry and bushfire applications; and places where flammable liquids and chemicals are not generally used or stored.

Generally these white textile hoses are cheaper and more vulnerable to damage and attack. They often have high-stated initial burst pressures, but often get damaged quickly and usually need frequent replacement. They are vulnerable to acid and chemical attack to the crucial jacket fibres, which can lead to sudden failure during use. They also need drying after every use, which leads to larger stocking requirements, and are more vulnerable to lining damage and fungal attack.

● Extruded or covered hoses:

The feature of these hoses is that the woven jacket controlling the pressure is protected by an elastomeric or rubber lining and cover.

Some of these covered hoses are of a "sandwich" construction, where an external elastomeric cover and lining are glued on to the textile jacket. This helps make the hose more resistant to abrasion and water pick-up than the textile hoses. These "sandwich" hoses are generally used for low-to-medium risk applications like general industry, some surface mining and maritime applications.

However, extruded hoses are the most durable covered hoses. They have a more resilient construction, where the rubber lining and cover are extruded under pressure through the weave of the jacket to make a very tough, effective and durable fire hose.

Both "sandwich" and extruded types are usually red, yellow or orange. Because of the rubber cover these hoses do not need drying, just a wipe down after use, which is far more convenient and saves valuable time. Consequently reduced stocking is usually necessary.

However it is the extruded hoses that are generally used – or should be used – for all higher risk applications. These include situations where flammable liquids and chemicals are used or stored, and where a fire would quickly escalate to cause a serious incident. It certainly applies to virtually all professional firefighting users, particularly municipal fire departments, airports and heliports, oil refineries and chemical plants, offshore opera-

tions, bulk fuel and chemical storage terminals, military applications, power generation, together with higher risk sites where staff are trained for firefighting duties. Examples of this include transportation services such as car ferries, mines, oil and chemical pumping stations and pipelines, and drilling/storage or production vessels.

The best covered fire hoses are the extruded type, particularly when certified to AS 2792. These are the most durable, reliable, maintenance-free and easy to use fire hoses that also offer the best value for money. But there are plenty of these covered types that, depending on materials and construction, fall short and can suffer problems of kinking, cover damage and quite rapid degradation. This is generally more common with the "sandwich" type products.

Pitfalls to specifying hoses

Care needs to be taken when selecting fire hoses as looks can be deceptive. Let us focus on covered hoses, as they are the most widely used group. They all look similar, but consider the key practical factors of hose life to meet the firefighters' requirements of durability, reliability and cost-effectiveness.

● Abrasion

This measures the hose's ability to withstand general wear and tear. Any hose dragged across rough ground will suffer abrasion and, where the jacket is exposed, this will immediately begin damaging the fibres that contain the water pressure, and likely shorten the life of the hose.

Covered hoses are more abrasion resistant with their elastomeric cover over these jacket fibres, while "sandwich" hoses are inherently weaker than the most durable "through the weave" extruded type hoses. The composition of the elastomeric or rubber compounds also affects its flexibility and resistance to abrasion. AS 2792 has an abrasion test that requires a 64mm diameter extruded type hose to survive 90 abrasion double strokes of the test machine and a few are certified accordingly. Many covered fire hoses fail this tough test at around 50 cycles, yet they all look similar.

● Lining damage

The internal lining can be damaged by inadvertently dropping heavy objects like couplings on the hose when uncharged, or laying it on sharp objects that can puncture the lining once filled with water and pressurised.

Textile hoses have little protection from such impacts, and the resulting lining damage can cause leaks reducing water flow and pressure to the firefighter, or bursts making the hose unusable.

Such lining damage in "sandwich" type hose channels the water, under pressure, along the layers of the sandwich construction. This can strip or de-laminate the cover or lining off the hose jacket along the weaker glue line, holding it all together. Once this happens the hose is usually scrap.

Extruded hoses, on the other hand, are made of a much tougher construction, which also helps insulate the hose from impact damage. The solid pillars of rubber joining the lining to the cover through the jacket weave resist de-lamination. Blistering of the cover may occur with some brands, as water builds up within the hose

construction, causing leaks or delayed burst.

One hose with over 20 million metres sold globally, and is renowned for withstanding such situations is Angus Fire's Duraline. Its rubber cover has latex plugged pinholes as part of the rubber curing process, making it exceptionally water and chemical resistant. Any lining damage will be relieved by popping out the minute latex plugs around the damage and identifying the spot, preventing further damage. Repair with a special rubber patch allows it to continue its duties unaffected and extends the life of the hose, providing outstanding value for money.

● Heat ageing

Hoses in any fire situations are likely to get hot from proximity to the fire, which can begin to weaken or even melt jacket fibres when they are exposed on the hose surface. The composition of the rubber cover can be crucial in protecting the hose from such radiation attack.

Several rubber-covered and textile hoses suffer rapid burst under such heat attack. Here the cover composition is all important. High nitrile content in the PVC provides excellent heat resistance. Only the toughest hose standards include a test using a metal cube at 600°C placed on a pressurised hose and timed until it melts through the cover/jacket causing burst. As you would expect, only the best extruded type hoses can withstand this stress, as the special rubber composition chars, raising the hot cube above the hose surface, insulating it from further damage and allowing water pressure to be maintained without bursting.

● Flexibility and kinking

While hoses are often used at substantial water pressures, frequently pressures are limited and many hoses will kink below about 5 bar water pressure. This can cause severe or dangerous flow restrictions – even the total water loss to the firefighter at the other end.

Kinking also causes raised points where rapid local damage occurs. Dragging a kinked hose can quickly wear a hole through the charged hose causing it to burst. Again special hose construction overcomes these common problems, where an all-nylon jacket provides the flexibility and stretch necessary within jacket fibres, to prevent the hose kinking between 3 bar and 5 bar pressure. This is easily tested by charging the hose to 5 bar water pressure while curved around a 200 litre drum; it should not kink. This performance level is still only found in the best extruded hoses, yet is a crucial requirement for any high-performance hose specification, to protect firefighters from sudden flow fluctuations, pressure reductions and potential burst that could all put their safety at risk.

● Moisture absorption and chemical attack

Exposed jackets easily pick up moisture and chemicals that can shorten life expectancy by quickly weakening the fibres, leading to unexpected bursts when the hose is next used. A "sandwich" rubber



Blistering can quickly lead to major hose damage. Pic courtesy of Kidde Australia

composition will tend to absorb water/chemicals over time and allow deteriorating attack. Many extruded hoses have minute pinholes in the outer rubber cover to allow volatile gases to escape during the manufacturing process. These can permit water and chemical ingress to weaken the jacket fibres over time, reducing their capacity to contain operational water pressures during use. This can lead to sudden failure during operation, putting the safety of firefighters at risk. Again citing Angus Fire's Duraline as an example, this hose has overcome this difficult problem with pinholes filled with latex plugs that prevent water or chemical ingress, so extending the reliability, working life and durability of the hose.

● Ozone attack during storage

Perhaps if the fire hoses are little used they will be safe from these assaults? Regrettably this is not usually the case.

Many elastomeric and rubber compounds are vulnerable to attack by ozone, a highly volatile atmospheric component. It occurs most frequently in areas of strong sunlight and causes cracking of many elastomeric compounds, particularly along stress lines, such as folds in layflat hoses. This adversely affects the lining and cover of fire hoses, unless the rubber compounds have special ozone quenching agents and a high nitrile composition. Selecting a certified AS 2792 extruded fire hose will ensure that it exceeds all the requirements for the particular application. Each length is individually pressure tested to 22.5 bar before factory despatch to verify its performance, long term durability and cost-effectiveness.

Firefighter safety is critical

As we have seen, textile and covered "sandwich" type hoses can be suitable for low-to-medium risk applications, but increasingly operators are beginning to appreciate the critical nature of fire hoses in emergency response plans.

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Safety on the Training Ground

The quality of the training and education for firefighters is, without a doubt, directly linked to the brigade's performance. Training must be conducted frequently enough to assure the team members are able to perform their assigned duties under adverse conditions in a safe and effective manner.

While some training is accomplished in the classroom, a safe replication of those real life adverse conditions is necessary to create a realistic environment that mimics the reality in which the firefighter will work. And that is the challenge those who operate quality training facilities routinely face, being extremely realistic, while being extremely safe.

The emergency response training facility at the university specialises in industrial fire fighting, hazardous materials response, technical rescue, aircraft rescue, and incident management services. We have been preparing emergency response professionals for almost 40 years and during this time have maintained an excellent safety record.

A safe operation is never the result of a single policy, procedure, or action. Just as there are multiple causes for accidents, so there are multiple opportunities to avoid them. In this article I will examine some of the behind the scenes activities that keep students, and staff safe on the training grounds. I will outline key components of creating the safe training environment, including the expectations we have of people, the construction of the facilities, and the management of the overall program.

People

We have the advantage of being a training institution rather than an uncontrolled environment. We can control the risks. However, live-fire training has inherent risks and while we anticipate problems, our expectation is there should be no accidents.

There is a high expectation for safe performance and personal accountability. Begun during the hiring process, prospective staff is assessed on safety attitudes and desire to be a team player. Many candidates come from high-risk fields including emergency response, heavy industry, and mining where an elevated degree of safety awareness is cultivated. After hire, every staffer is given the responsibility for safety of themselves, each other, our students, stakeholders, and visitors. Performance standards and evaluation processes formally outline the expectations of each staff member.

Safety expectations are continually reinforced, starting with daily operational meetings and continuing throughout the day as supervisors reinforce the message to the staff. Organised by dedicated safety specialists, staff develops and delivers safety training during tool-box talks and at regularly scheduled group meetings. Higher risk

TRAINING GROUND SAFETY



tasks and operations, such as prop overhauls and testing, require additional training and safe work procedures.

The most important priority is the safety of all students, faculty and staff. For students, this priority is communicated before they arrive at our campus. The registration process outlines the behaviours we expect from the students and the consequences for non-compliance. They are given the responsibility to comply with all policies and their acceptance of this responsibility is documented during the registrations process.

All students, even those attending classroom training, receive a welcome briefing that reinforces the expectations and provides general information. This includes a review of alarms and their meaning, evacuation and accountability procedures, and how to respond in case of an accident. Expectations for student conduct are also reviewed. At no time does the academy tolerate any action which jeopardises the comfort, safety or health of others.

Students attending classes with field training receive additional training on safety features of the campus, including the incident command system, first aid and emergency medical supplies, the importance of hydration, and additional evacuation accountability and emergency procedures.

Physical requirements for field training

Most live-fire training facilities endeavour to provide a safe, challenging, and realistic training experience. All students must participate in every aspect of the training program in order to receive a passing grade.

Fieldwork is conducted in approved personal protective equipment, including self-contained breathing apparatus (SCBA) and other appropriate equipment, which can be considered physically and mentally strenuous. We know fire-fighting and other field training exercises often require rigorous physical and emotional exertion, exposure to extreme temperatures, water, and toxic atmospheres. Participants are encouraged to anticipate the environment and physical nature of the training.

As with any strenuous physical activity, we recommend students consult with their physicians prior to engaging in courses that require field training exercises that may challenge their level of fitness. The reasoning behind this is that exercises may be conducted in confined spaces, at heights, during inclement weather, and in our case at high elevations (1,493 meters above sea level). Field safety specialists are certified at Emergency Medical Technician – Basic (EMT-B) level or greater and oversee all field training exercises. They monitor students before, during and immediately after field training exercises looking for signs of physical and mental stress.

Conducting field training exercises

As previously mentioned, staff conduct a safety briefing prior to all field training exercises. During the briefing the students are reminded of their responsibilities and emergency procedures. Additionally, students are reminded that during exercises, anyone with a legitimate concern may stop the exercise at any time to prevent injury, equipment, or property damage. Further, we value the environment and make every effort to operate an environmentally sound training facility.

Field training focuses on the basics and reinforces the notion of "how you train is how you

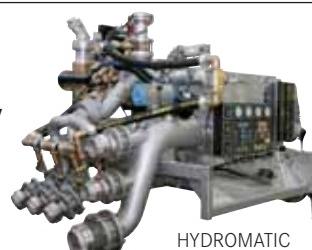


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"will fight" in a real emergency. What may seem like minor deficiencies, such as not having a coat fully buckled or a hood and earflaps fully deployed, can result in major problems, especially when performing under stress.

The training field is equipped with readily available first aid kits, emergency medical supplies, eye-wash stations, and staging areas. Locations to evacuate to in case of emergencies are designated.

Dehydration is a major concern during field training exercises. Students and staff are reminded in the initial and pre-exercise briefings to not wait to feel thirsty to drink and to remain hydrated at all times. On the training grounds there is free access to water and sports drinks to replace electrolytes and carbohydrates. The changes in the season (even in the winter you will perspire) and weather will have different effects on personnel and the hydration supplies are matched to the environmental conditions.

While on the live-fire training grounds, fire resistant clothing is required and all personnel in the hot zone are required to wear a complete set of firefighting gear consisting of a firefighting helmet with ear flaps and face shield, protective eyewear, NOMEX or equivalent hood, bunker coat and pants, firefighting gloves and boots. Students enrolled in public or open-enrolment courses also wear SCBA in the hot zone. Personal protective equipment for all field training must conform to the applicable standard issued by the National Fire Protection Association (NFPA), the Occupational Safety and Health Administration (OSHA), the American National Standards Institute (ANSI), and other recognised authorities.

Facilities

At our academy we simulate various scenarios including process units that include pump, valve, seal, flange, and piping fires and flame impingement scenarios. These full scale mock-ups, or props, are designed to leak liquid hydrocarbon fuels and liquefied petroleum gas (LPG) under controlled conditions to give students a real experience with Class B fires. Obviously safety must be built into the props from step one.

Prop designs are born from the reality or curriculum we want to replicate. One of the best places to start the design process is by listening and talking with the users and by conducting a review accident reports. Lessons learned from our clients, who have operated the equipment or units to be replicated, and firefighters, who have actual experience, provide a firm base from which to start a prop concept. We employ a team approach and involve program managers, curriculum development specialists, safety and operations personnel, maintenance supervisors, environmental managers, administrators, risk managers, and of course end users.



Our next step is to involve engineering personnel to ensure compliance with applicable codes and regulations and anticipated working loads. Consideration for ongoing maintenance is given in this phase. Once engineering is complete construction begins.

The academy utilises a high-pressure fire water delivery system compliant with NFPA 1402 Guide to Building Fire Service Training Centers guidelines

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and provides approximately 9.65 bar to the fire field hydrants. The fire props are designed to be fought with multiple one and three-quarter inch attack lines flowing 360 litres-a-minute. This arrangement provides an abundant amount of water for multiple fire attack groups and prop cooling.

The fire fuel, a blend of liquid hydrocarbons, is pressurised to approximately 5.5 bar and piped to the prop's fuel control platform. Controlled by a fuel stand safety operator (FSO), or "Fueler," fire fighting students are given an opportunity to fight large, aggressive fires that will push them to the limits of their endurance and capabilities. The process is designed to promote learning, confidence, and pride in their fire fighting abilities.

Props are inspected by maintenance and safety staff before and after each use. Inspectors look for any sub-standard conditions or changes to the structure, cooling and fuel delivery systems, flame points, walking, and working surfaces to ensure they are ready.

Program management

Certainly a discussion of safety on the training grounds is incomplete without reference to NFPA 1403 Standard on Live-Fire Training Evolutions.

As the standard cites "the ongoing training of firefighters is the cornerstone of good fire protection in today's world." But as it is written in the scope of the standard and also in NFPA 1402, these are minimum, general requirements.

We have previously examined the need to take personal responsibility for your safety, and the safety of others, so in this section we will highlight some of the key operational or administrative practices to maintain and improve safety on the training grounds.

Our strategy is to use technology when it is beneficial and use the human touch whenever possible. We strive to develop a team spirit between the students, our instructors and staff, making the most of each other's strengths, while protecting each other's weaknesses. This team approach, quite similar to the real world, builds an environment that reinforces the message that safety is paramount.

After prop inspections, evolutions are pre-planned by the instructor(s), lead safety officer

(LSO), and field maintenance staff. What flame points will be used, in what sequence and intensity is decided. Any planned "surprises" for the students are discussed, as are any other potential unknowns, such as personnel issues identified in previous exercises.

The plan is implemented and instructors lead students through evolutions reinforcing and practicing the concepts and techniques learned in the classroom. In the background is the safety team comprised of the LSO, FSO, and additional safety officers.

Tight communication between the instructor and safety teams during the evolutions make adjustments to the fire ground to enhance the students' experience. Using two-way radio, hand signals, and, if needed, runners, instructors and the safety team control fuel and cooling water flows and maintain the safest, most realistic fire the students can manage.

Like many facilities, several props are operated simultaneously and upwards of 100 people may be on the training ground at any given time. Additional instructors and safety officers are brought in to maintain the low staff-to-student ratios we prefer. The incident command system is expanded from its single prop make-up to an area command structure to accommodate all props in use.

Just as props require regular maintenance, so do the staff. From daily operational meetings through required annual refresher training, the expectations of the organisation are continually reinforced.

Summary

In this article we examined some of the activities that keep our students and staff safe on the training grounds while fostering the desire for continuous improvement. We also examined key components for creating a safe training environment; the expectations of people, the facilities, and operating practices. This multi-faceted approach results in a quality training experience for students and a healthy work environment for staff. This approach is ingrained into every aspect of our program because we know the quality of the training and education a person receives is, without a doubt, directly linked to their performance.

Mitchell C Baclawski is Principal, FSA Worldwide, and leads FSA outreach

For further information, go to www.fireacademy.unr.edu

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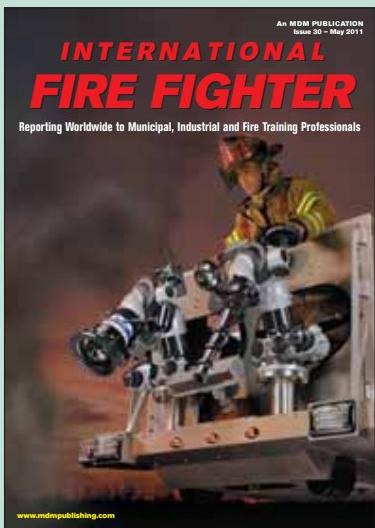
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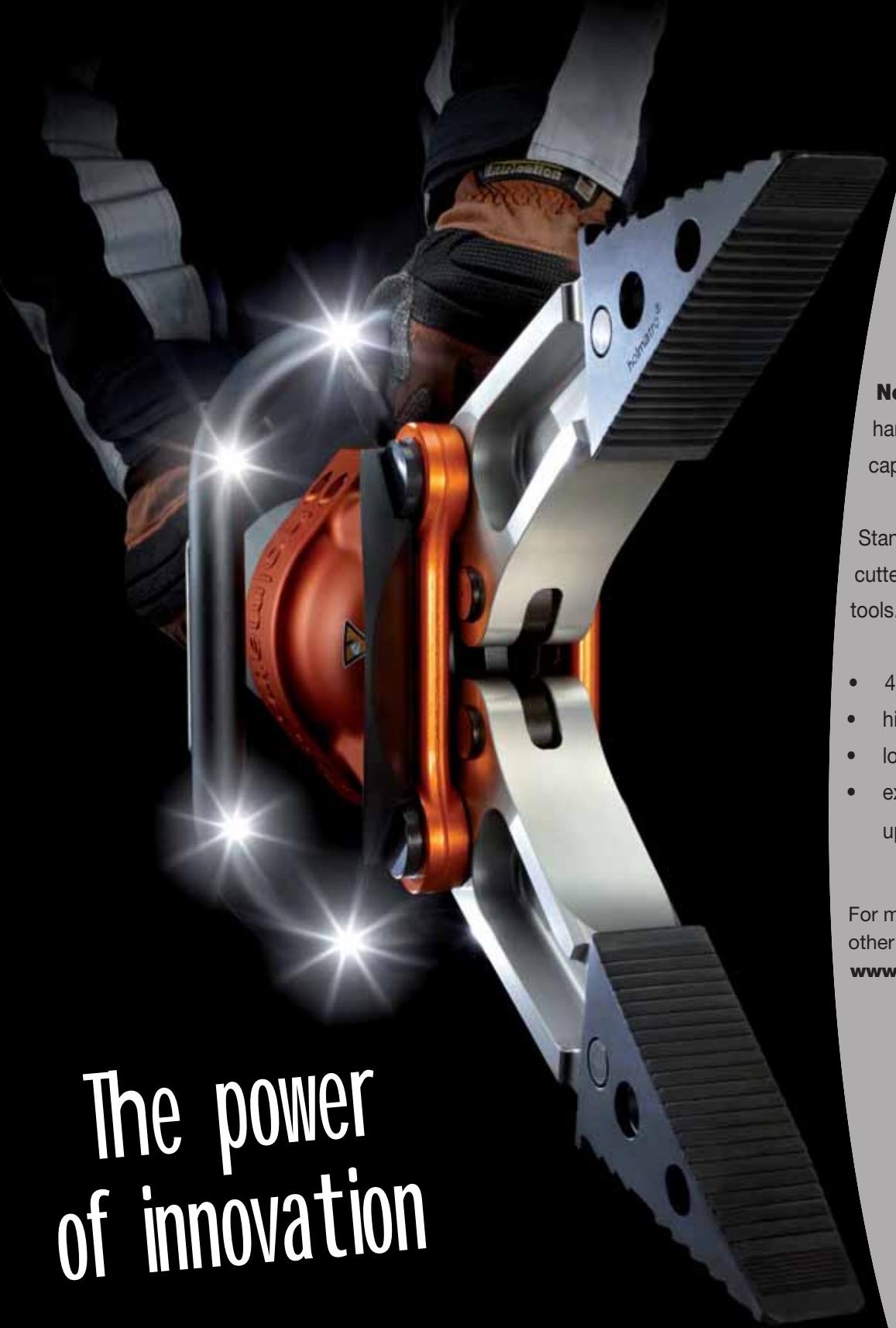
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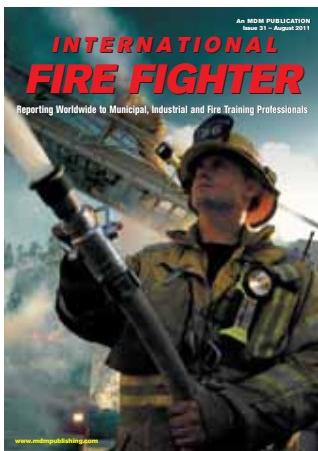
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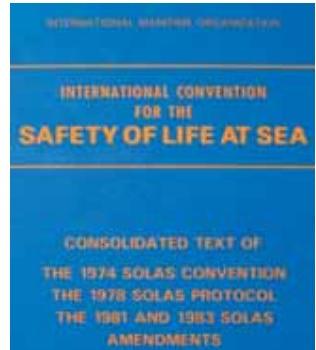
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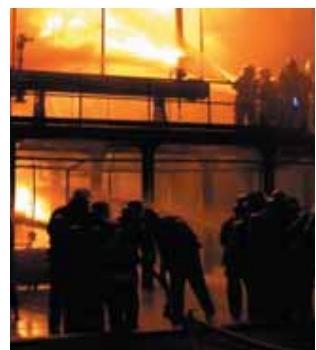
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Graham Collins

A Day to Remember

Each of us can recall exactly where we were, who we were with, what we were doing, possibly even what we were wearing when certain landmark events happened in our lives. Most are deeply personal events that relate to people and places we know; some though are events with which we have no direct personal involvement but are nevertheless shared by us all.

Take the assassination of President Kennedy; I doubt that there are many readers of International Fire Fighter who were around in 1963 that cannot recall vividly the moment they heard of his death in Dallas. Sadly, the same will apply this coming September when we are all sure to remember the events a decade ago when the twin towers of the World Trade Centre in New York were destroyed

In the final analysis, it is the actions of men and women that truly save fire-trapped victims, rescue those pinned down in collapsed and mangled buildings, and extricate casualties from crushed vehicles.

in what was arguably the world's most heinous act of savage terrorism. A day when, of the 2752 deaths, 343 firefighters from the New York Fire Department paid the ultimate price for their gallantry and devotion to duty. The death toll also includes a further 70 emergency services personnel, and it has the chilling record of being the largest peacetime single-event loss of life of fire and rescue personnel the world has ever experienced.

This anniversary will be particularly harrowing for the wives, girlfriends and children, friends and colleagues of those firefighters, and for those who with a similar lack of thought for their own safety played their part in the rescue effort and survived. It is also sure to be a time of reflection

for emergency services personnel around the world. Better than anyone else, these men and women can envisage what the New York firefighters went through on that day, picture what conditions must have been like, imaging what must have been going through their minds. While, as the real-time television coverage portrayed, thousands in the surrounding street were – understandably – either dumbstruck with disbelief, or fear, or both, the New York City Fire Department far exceeded anything that could reasonably be asked of it.

The editorial pages of International Fire Fighter are filled regularly with news and views on the latest equipment and techniques while, from the advertising that appears in each edition of the magazine it is clear that manufacturers and service suppliers

around the world continue to strive to produce better performing, more reliable, versatile and safer solutions. But, in the final analysis, it is down to the actions of men and women that truly save fire-trapped victims, rescue those pinned down in collapsed and mangled buildings, and extricate casualties from crushed vehicles.

So, I feel sure that every reader of this edition will join the staff of International Fire Fighter in remembering the NYFD guys who perished on the 9th September; a day when all in the supply-side of the firefighting industry are sure to feel renewed gratitude to all fire and rescue personnel around the world who continue to put their lives on the line for us.

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The Future of Cutting

'The future of cutting', is a bold claim, but one that WEBER RESCUE feels is fully justified. After taking a close look into the design and development of the company's revolutionary concept you can clearly see that the design and engineering teams at Weber Rescue Systems have produced something truly worthwhile to offer those working in rescue and extrication.

Putting what the company calls High Strength Cutting or HSC inserts into the blade arrangement of the rescue cutter seems, at first glance, to be obvious really, but years of extensive and painstaking research and investment, along with relentless testing, tells you that something so obviously beneficial is not always so easy to achieve. But achieve it Weber Rescue Systems have, in fact the Austrian design team have excelled themselves and brought to the market a rescue cutter like no other in the world and set a new market standard, as these new 'Xtreme' performance blades are able to cut the latest composite materials used by vehicle manufacturers.

Audi's Cabriolet Submits

Recent tests on the most up to date car posts, including those on the Mercedes CLK and similar vehicles, have provided testimony to the cutting power of this tool. One recent testing scenario saw the 'RSX 200 Plus' cutter make a number of successful cuts through the A-post of the new Audi A3 cabriolet. Many firefighters and experienced road traffic collision personnel will appreciate the strength and reinforcement of such post sections.

Cost Effective Blades

Weber Rescue is not claiming that this cutter has the ability to cut all cabriolet posts, nor should you



have the need to do so, but should you ever have the need for blade replacement then you need only to exchange the inserts themselves.

This 'life cost' benefit is of great interest to those involved in the maintenance and support of their operational equipment, as the cost of the inserts themselves delivers significant savings. The composite make-up of these blades is so specialist that this, says Weber Rescue, could be the only rescue cutter to 'stay sharp' during the life of the tool.

For any fire and rescue service that has experienced issues with the ability to cut new car materials, the company would urge them to trial this groundbreaking equipment and join 'Team Gold' as these cutters from Weber Rescue are certainly 'a licence to cut'!.

IF

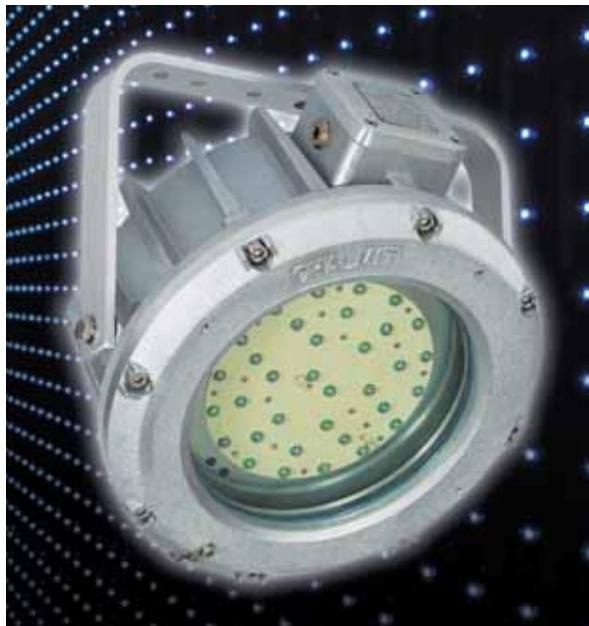
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Email reiner.antritter@weber-hydraulik.at

New ATEX LED Floodlight

A new floodlight combining maintenance-free LED technology and a self contained backup battery has been introduced by CHALMIT. Called Solas, it is designed for use in both Zone 1 hazardous areas and harsh marine environments and provides the same level of light output under either normal or emergency conditions.

In contrast to high intensity discharge floods, the Solas is effectively maintenance free, offering over sixty thousand hours of continuous operation. Another advantage of using LED technology is the efficient use of the light generated. The Solas has a high light output ratio resulting in over four thousand lumens with minimal losses. These levels can be compared to a 70 watt high pressure sodium (HPS) floodlight. However unlike HPS lamps the use



of LED results in a much whiter light closer to that of natural daylight.

The new luminaire is compliant with both ATEX and IEC Ex standards and is suitable for use in a wide range of ambient conditions from -55°C to +55°C. An industrial, non-hazardous version is also available that provides the same levels of IP66/67 ingress protection and maintenance-free capability.

According to Chalmit, the Solas is ideally suited to provide emergency escape lighting, for example, during platform abandonment conditions, where the sea must be illuminated to ensure lifeboats can be safely launched.

For more information, go to www.chalmit.com

Batteries Included

LUKAS is heralding its eDRAULIC equipment as the first complete mobile rescue set to include cutter, spreader, combination tool and rescue ram offering mobility, space and weight benefits – a complete eDRAULIC rescue set is said to be up to 70 kg lighter than a hose-connected set – for rescue personnel. Versatility is given as being down to the gear's compact electro-hydraulic drive that can be powered by a power supply or by specially developed batteries where the maximum freedom of movement and handling is called for.

The performance of the high-end batteries used in the eDRAULIC series far exceeds what was available just a few years ago. On average, they reliably deliver 30 minutes of full power in a rescue operation; enough to free people from at least one vehicle. All of the batteries are identical in construction and can be swapped swiftly from one eDRAULIC rescue tool to another.

All of the tools work at an operating pressure of 700 bar, whether on power supply or battery power, matching the performance and speed of comparable hose-connected tools. As an example, the company cites its new eDRAULIC S 700 E cutter where performance surpasses the earlier hose-connected top cutter in the LUKAS range, the S 510. The capacity of the built-in hydraulic pump can be adjusted for each individual tool, and the cutter opens and closes even more quickly.

For more information, go to www.lukas.com



New Rescue Belt



MSA has introduced a new device for emergency egress. The Rescue Belt II System allows firefighters trapped in a building's upper level to rappel to safety.

The ergonomically-contoured Ara-Shield fabric rescue belt pouch easily stores the firefighter's rope, descender, hook or carabiner and is compatible with all MSA pouches, including ExtendAire II and Quick-Fill Systems. It meets NFPA 1983-2006 edition for Fire Service Life Safety Rope and System Components.

For more information, go to www.msanet.com

Safe Communication

The Land Berlin Fire Department in Germany has placed an order with CEOTRONICS for intrinsically safe ATEX – the EU's explosive atmospheres Directive – CT-MultiComs digital radio communications systems worth in the region of €1 million.

The multi-functional CT-MultiCom can be used as a handset with speaker and microphone to remotely operate a two-way radio or as push-to-talk (PTT) radio with an attached communication system. It is designed to be conveniently operated when wearing thick gloves, with the elbow, or even under clothes. It is certified IP65 (dust and hose proof) in accordance to EN 60529.

For more information, go to www.ceotronics.com



Live Fire Trainers



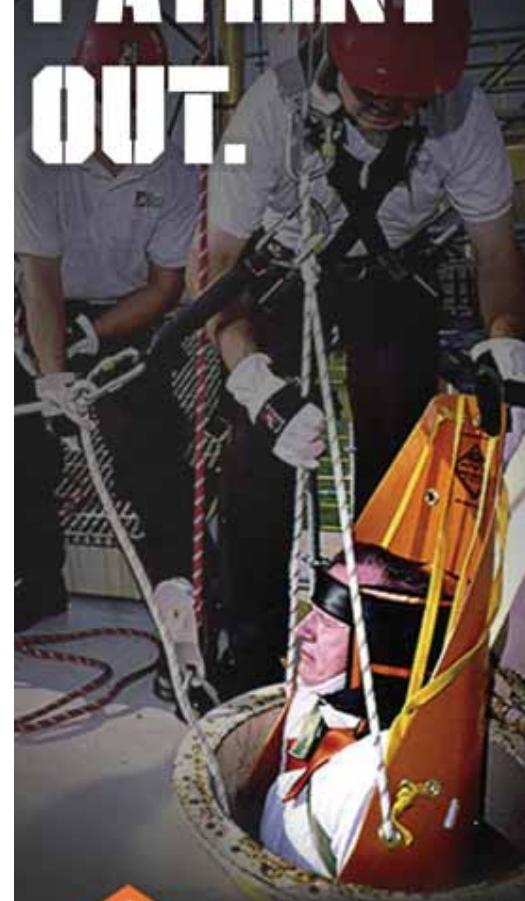
Maine Air National Guard Fire Department in Bangor, Maine, USA has taken delivery of a heavy-duty BULLEX vehicle fire training prop and a heavy-duty helicopter fire training prop. Both live-fire props feature multiple burn zones that create engine, passenger compartment and fuel spill fires.

The portable life-sized helicopter training system features moveable main rotors as well as functional cockpit and cabin doors. The vehicle prop provides 40 million BTU of live propane flames and 900 kilograms of heavy-gauge steel.

The Maine Air National Guard Fire Department is a full-time professional operation that provides fire and emergency services to the 101st Air Refuelling Wing and the Bangor International Airport.

For more information, go to www.bullexsafety.com

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CBRN Approval for S.E.A's SE 40 Respirator

The SE40 powered demand respirator, designed and manufactured by The S.E.A. Group, is used by fire services, first responders and emergency management outfits around the globe. It has now been given British Standard CBRN-PAPR approval.

Testing was conducted by INSPEC in accordance with the British Standard 8468-4 specification covering powered air-purifying respirators (PAPR) for use against chemical, biological, radiological and nuclear (CBRN) agents. The approval further underpins the solid reputation of the SE40, along with its existing American NIOSH CBRN approval.

The British Standard certificate classifies the equipment as a 2A type respirator (tight-fitting full face mask) with the filters approved as Class 90 TM3P SL, which might require some explanation:

- 90: more than ninety minutes' gas filtration capacity.
- TM3: the highest protection level for this type of respirator (protection factor 2,000).
- P: particle filter with over 99.95 percent separation capability.
- SL: tested for both solid particles and liquid aerosols.

Demand Principle

What is not evident from the British Standards classification is that the SE40 does not function like a conventional continuous-flow PAPR. It operates on the demand principle, much like a breathing apparatus. The air supply opens on inhalation and closes on exhalation. In short, air only goes through the filters when the wearer breathes in. This greatly extends the life of the canisters, with significant savings as a result.

Built for the Emergency Professional

SE40 offers many essential features for response and rescue personnel, such as voice communication, light weight, high mobility and much more. For many emergency workers, operation time is critical, and the usage periods of SCBA cylinders seem very limited in comparison with the several hours of operation offered by the SE40.

The SE40 is capable of delivering air flows over 400 litres/minute, which means that positive pressure is maintained in the face piece even at heavy work, such as many rescue operations. This minimises the risk of inward leakage, as can often be the case in conventional PAPRs.

The emergency professional wants to be able to 'set and forget' the respirator and concentrate on the task at hand. That is why SE40 is a single-button respirator. It constantly senses the user's breathing and adjusts its fan speed for optimum air delivery, and no further controls are needed.



The filter canisters have been tested for a wide range of industrial chemicals and CBRN warfare agents such as sarin, phosgene, mustard gas, nerve gas, cyanogen and many more, including hazardous biological materials.

The 125mm diameter of the light-weight filters leads to extremely low pressure drop over the canister, and the large volume of filtering media means great adsorption capacity and long service life. The British Standard has classified the SE40 filters as 90+ minutes capacity, far greater than other CBRN-PAPR products on the market.

The respirator can be used with a variety of pressurised protective suits, including a military-grade encapsulated model that has been tested for warfare agents.

Accessories and Storage

Optional accessories range from welding visors and heat shields to head harnesses and battery management systems. The SE40 can be supplied in a rugged military-style bag (as an accessory not covered by the British Standard). The stackable bag itself meets NIOSH environmental tests, simulating nine years in the boot of a car in extreme temperatures, followed by a live agent test.

The SE40 and its predecessor SE400 have for a long time served first responders around the world; among them police, forensic, medical, and military groups, including specialist teams at several Olympic Games. The new British Standard approval can only further consolidate this respirator's superior reputation among European fire and emergency professionals.

For more information, go to
www.theseagroup.com
 Email sea.australia@theseagroup.com

New Pumper Fleet

The Longmont Fire Department in Longmont, Colorado, USA has taken delivery of five PIERCE MANUFACTURING Velocity custom rescue pumper vehicles.

Each of the pumpers is equipped with TAK-4 independent front suspension, a 470-hp engine and Command Zone electronics. The firefighting system includes a 1890-litre water tank, stainless steel body, 7570 litres-a-minute rear-mounted water pump, Husky 12 foam system with 150-litre foam cell, wireless remote control deck monitor and hinged compartment doors.

The 1.8-metre long cab features a 255mm raised roof, seating for six firefighters, both frontal impact and side roll protection systems, EMS cabinets inside the cab, an LED light package and a dual module vehicle data recorder. Large storage compartments carry a wide range of rescue tools and emergency equipment.

Longmont is 65 kilometres north of Denver and is mostly suburban but also is industrial, urban, and rural. The Longmont Fire Department provides



fire suppression, emergency medical services, technical rescue, hazardous materials response, fire investigation, public fire education, code review, and building fire inspections, and operates

Urban Search and Rescue, Technical Rescue and HazMat teams.

For more information, go to www.piercemfg.com

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Safe Option for Brigade



Hampshire Fire and Rescue Service in the UK has adopted the ASTIUM GEO-INFORMATION SERVICES' SAFECOMMAND vehicle-mounted data system for all of its 130 appliances across the county in a move to ensure its firefighters receive critical front-line emergency information.

SAFECOMMAND provides fire crews with access to the latest operational data including potential risks at an incident location – such as gas cylinder storage or how to gain access to particular stretch of river – from their in-cab terminal on the way to an emergency call. This ensures that they arrive at the incident better informed, and that they can optimise their performance quickly on arrival at the site of an emergency.

The new system replaces a paper-based file system that was difficult to maintain and keep up-to-date. With SAFECOMMAND data held on each appliance terminal is scheduled to update automatically twice a day to reflect any recent inspection results carried out by the extended team and equipping firefighters with the very latest information collated by Hampshire Fire and Rescue Service. It dramatically reduces the time taken to update records, and ensures that Hampshire's frontline firefighters have access to critical information that can enable faster responses in emergency situations.

For more information, go to www.infoterra.co.uk/safe-command

Size Matters

Smaller fire engines are being used as front-line emergency response vehicles at certain DEVON & SOMERSET FIRE & RESCUE SERVICE stations. The move is believed to make it the first fire service in the UK to combine smaller appliances with compressed air foam systems, instead of water and reduced standard equipment carried on the appliance, according to the risks in that location.



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Initial trials have indicated that the smaller Light Rescue Pumps (LRPs) appliances may reduce response times to certain incidents by up to 20 percent and could potentially replace the larger, standard fire appliances at a number of fire stations across the counties of Devon and Cornwall.

Light Rescue Pumps perform the same role as larger fire engines. For example, they carry the same number of firefighters, water, compressed air foam, breathing apparatus and road collision rescue equipment, and attend the same emergency incidents. However, they are lighter and smaller than traditional fire appliances and have significant advantages, particularly in rural areas where the roads are narrower and in places where badly parked cars are an issue.

For more information, go to www.dsfire.gov.uk



NOW WITH BRITISH STANDARD

SE40, the world's first positive-pressure demand CBRN respirator, now carries both NIOSH and British CBRN-PAPR standards approvals.

The SE40 works on the demand principle, just like a breathing apparatus: it opens the air flow during inhalation, and blocks it during exhalation. This means a considerably longer filter life.

Designed especially for the emergency responder: no heavy cylinders, great mobility, long operation time, single-button control, 'set and forget' operation.

The SE40 has been tested for a wide variety of CBRN hazards. Wear it with or without a protective suit.

Check our website for NIOSH and British standards approval documentation.



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Smart Solutions for First Responders

Over 65 years ago, SCOTT SAFETY introduced the first Air Pak SCBA to the fire services and since then, the company has supported first responders around the world with innovative products, smart solutions and a dedicated level of support.

Today, Scott Safety offers SCBA, compressors, thermal imaging cameras, communications, accountability and personal location products for firefighters, EMS, HAZMAT and law enforcement applications. Scott Safety takes its responsibilities to this industry very seriously, knowing that every day thousands of people rely on its products to keep them safe in hazardous situations.

Since the introduction of thermal imaging technology to the fire services, Scott Safety has been providing advanced, fire-ground proven thermal cameras to first responders for use in search and rescue, overhaul operations and hot spot identification.

The new Eagle Attack thermal imaging camera delivers all the performance, quality and durability that firefighters demand. After consulting hundreds of firefighters about the design and development of this product, the Eagle Attack offers a full-featured imager in a compact form with no sacrifice on quality.

The new Eagle Attack thermal imaging camera delivers all the performance, quality and durability that firefighters demand. After consulting hundreds of firefighters about the design and development of this product, the Eagle Attack offers a full-featured imager in a compact form with no sacrifice on quality. Smaller-sized cameras typically sacrifice features and image quality for portability and while larger imagers are feature-rich, they can be bulky and more difficult to handle in tight situations. The Eagle Attack is the perfect combination of the best of both small and large imagers.

With a generous display, a high degree dynamic range and class-leading resolution and sensitivity, the Eagle Attack makes fire analysis quick and easy. All together, the Eagle Attack is one of the lightest, most easy to use fast attack imagers available today. The camera offers either a greyscale or color imagery and the optional Scott thermal video recorder (TVR) automatically captures every event for training and documentation purposes.

Fire brigades and emergency service organisations of today must continually strive to reduce firefighter deaths and injuries. Sadly lives are still lost through the inability to locate a fire fighter within a structure when he or she is in trouble. In order to address this important issue, Scott Safety recently launched the ALERT ATS, the latest development in

advanced firefighting electronics and telemetry offering fire brigades the opportunity to create a system which meets their exact requirements.

The modular approach enables the ALERT ATS to operate in its most simple configuration, as an evacuation two-way radio signalling device, while at its most advanced level, it can be operated as a fully computerised entry control management system with digital tally board. Users choosing a simple system can easily add on more advanced elements if they wish to upgrade at a later stage to a more sophisticated arrangement to include units such as a telemetry entry control board or the Scott Command computer monitoring system.

The new digital pressure gauge enables an immediate understanding of air supply levels, time to whistle and temperature data, offering reassurance to continue working regardless of the surrounding risk. The permanently back-lit screen provides a clear and easily readable display containing all the required information to eliminate the need to scroll, while visual warnings alert the user and nearby colleagues. The one button operation unit logs all data for download as required.

The robust Telemetry Entry Control Board delivers critical levels of accountability as pressure, time remaining and time elapsed data is transmitted real time. The built-in technology and fast boot-up means that the ALERT ATS is simple to use, gives clear status information, making it the ultimate evacuation control system.

And that is a key theme for Scott Safety; that reliability, quality and performance cannot be compromised when it comes to finding cost-effective solutions to the critical needs of today's emergency services.

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German Brigade Upgrades PPE

Hamburg Feuerwehr in Germany, has upgraded to TRELLEBORG PROTECTIVE PRODUCTS' Trellchem EVO type 1a (Level A), fully encapsulated chemical protective suit for first responders.

The brigade will also have Trellchem EVO type 1b suits in service.

According to reports, Hamburg Feuerwehr selected the Trellchem EVO suit because of its ability to withstand harsh environments and compliance to the stringent regulations and standards applying to protective suit materials and the suits themselves. Trelleborg says that the suits can be donned quickly as it has only a single layer, while the built-in flash protection and superior abrasion resistance allows Hamburg Feuerwehr's responders to perform their jobs with greater functionality and safety.

Trellchem EVO suit material and seams have successfully performed in chemical permeation resistance tests (permeation rate: 0.1 microgram per sq cm and minute) with the 20 industrial test chemicals that are the most hazardous and aggressive listed in EN 943:2 and



in the American standard NFPA 1991. The test regime was undertaken for 24 hours, which is well in excess of the traditional test length of eight hours.

The Trellchem EVO is a reusable, single skin, one layer suit made of a new garment material developed and produced by Trelleborg. It is a combination of specialised rubber and polymer barrier laminates, together with a special woven fabric that forms a strong and flexible material, offering outstanding chemical resistance properties in combination with excellent resistance to chemical flash fire, liquefied (cryogenic) gases, abrasion, punctures and tears.

Standard features include fogless lens, Trellchem bayonet glove ring system and high impact resistant visor with tear-off lens to protect the visor from scratches. Trellchem EVO type 1b suits have the Self-Contained Breathing Apparatus carried outside of the suit.

For more information, go to www.trelleborg.com

Enough power for Four

LUKAS has launched what it claims is the first petrol power unit with enough hydraulic power to operate up to four rescue tools at the same time. The new P 650 motor pump series enables simultaneous operation of four tools for faster rescue operations using the turbo function. It is, says Lukas, ideal for major accidents, enabling rescue crews to work on several vehicles at once.

With one hand movement you can double the oil flow to one tool in order to work twice as fast. This feature is particularly valuable for operating rescue rams that call for a large volume of oil. All valves are accessible from the front, tank levels visible from outside, and the power pack is designed for operation with gloves.

For more information, go to www.lukas.com

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All Tooled Up

The problem of overlooked or misplaced rescue tools such as seatbelt cutters and hook and fork tools has been addressed by HOLMATRO with its new Rescue Support Bag containing the most frequently used vehicle extrication assist tools.

The lightweight tool bag is designed to allow easy movement during the rescue operation, and is made of tough, fire-retardant material. It comes with adjustable waist and thigh straps that are easy to secure by means of a three-point click buckle. The Rescue Support Bag can also be Velcro-attached to a rescuer's belt.

It contains a tyre deflator, seatbelt cutter, window punch, flexible steel rule, marker pen, mini LED torch, multi-cutter and hook and fork tools.

For more information, go to www.holmatro.com



All at Sea



Flaming Genius

The latest line in MSA's FlameGard Series, the FlameGard 5 flame detector offering, is now available. At the forefront is the FlameGard 5 MSIR Detector, a multi-spectral infrared detector that features breakthrough neural network intelligence for reliable discrimination between actual flames and nuisance false alarm sources.

Additional models of the FlameGard 5 Flame Detector range include the FlameGard 5 UV/IR Detector and the FlameGard 5 UV/IR-Hydrogen Detector, both of which use ultraviolet and infrared detection technology to provide high immunity to false alarms. The FlameGard 5 Test Lamp for testing the FlameGard 5 Detectors is the final component in the new series.

For more information, go to www.msanet.com/flamegard5



Structural fire fighting kit supplied by COSALT WORKWEAR is now approved for use at sea.

The company is a leading supplier of shipping and marine safety equipment such as lifejackets and immersion suits. The approval covers all of Cosalt's existing range of structural fire suits and new designs will be in compliance with the fire protection requirements of Marine Equipment Directive (MED) 96/98/EC as well as the CE Mark. The standard will be indicated on the garment's label by the addition of the MED 'Wheelmark' logo next to the CE Mark, together with the identification number of the notified body.

For more information, go to www.cosalt.com



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Structural Collapse Rescue – New Solutions for an Old Problem

Techniques for structural collapse rescues have been developing rapidly since the mid 20th century. Major drivers for change have been conflicts, major disasters and the technology of instant media coverage.

New hazards have seen new approaches to taming them. New equipment, increasingly developed specifically for rescue work rather than an opportunistic variation on existing tools, has transformed working practices. The concept of safety as a fundamental consideration has rightfully informed judgments on how to perform rescues and run operations.

To Rescue a Trapped Victim, First Find Them

Even in small scale collapses, the sight of piles of debris is a daunting one. Where do I start? Where is the person? Is there anyone here anyway?

The application of common sense, harnessing of evidence, interrogation of witnesses, having a methodical, structured plan, using all means of search at your disposal in the correct sequence will

assist in the primary aims of urban search and rescue – finding and rescuing the victims.

Having a simple, pre-planned process that reduces risk and saves time is obviously a good thing. In structural collapse, variations on 'six stages of rescue' are commonly used. If this can be part of a teaching system that is able to benefit from best practice and feedback from around the world, so much the better. The training process for those involved in structural collapse can be an addition to the skill-set already held, for example, by firefighters, or for a specific role in disaster response. It should incorporate different levels of training, from an awareness level for everyone in the organisation, through the operator level, specialist trainers and management training too. When a whole new area of expertise is introduced to an organisation it is often those at management



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level who miss out on the process, leading to lack of understanding, antipathy and lack of efficiency.

The person in charge of the first attendance at a structural collapse has to deal with many pressures, not just those of managing the rescue resources, but also the expectations of relatives, other emergency services, and the public. It is very difficult to say: 'We are not going to risk our lives in this particular instance – we are going to put a number of safety measures in place, which may take a long time, before we commit ourselves to enter the collapsed structure.' Difficult, but it can be the right thing to say. What we need to do then is make sure that the reasons for the decision are explained to all the stakeholders.

If the area of search can be reduced to a minimum this means that we can concentrate our efforts and be time efficient. Time is the thing that we are really short of in these situations.

Having found that there is a probability of there being a live, trapped person involved, we can narrow down the locations to be searched by the use of search management techniques such as asking where was the victim last seen, what were they doing, and where could they be expected to be at the time. Don not forget the basic one of calling their mobile phone and listening for the ringing – you might be lucky! The rescuers at a Glasgow, Scotland collapse knew they were getting close when they found the keys and phone of one of the victims.

If the area of search can be reduced to a minimum this means that we can concentrate our efforts and be time efficient. Time is the thing that we are really short of in these situations. This does not mean that we should be superficial with our search: it is just as important to have a high probability that there are no victims in a particular sector as it is to completely search the whole area. We can then confidently move on to the next sector to be searched. It may be acceptable that there is an 80 percent probability that the missing person is not in a patch of forest, but it needs to be pretty near 100 percent in a building. In instances of widespread, severely affected structures, such as happens in large earthquakes, there can be a desire, at least initially, to try and get to as many sites as possible in as short a time as possible. Having a system that identifies the most likely buildings and areas for victims to be in will help.

Among new developments in search tools are improved ground penetrating radar, new generation sound detection and location, and detectors for the substances humans emit such as carbon dioxide. These should result in the speedier location of live victims, but the reality is that you need to use all available high- and low-tech systems, so don not abandon the line-and-hail just because you have the mark 23 audio probe. And

remember that search dogs can sometimes make mistakes and also have a lot of limitations (but do not tell the dog-handler that!)

The Victim has been Located – Now What?

Stabilising the structure may already have started. The use of shoring is absolutely essential in many cases, as it is very difficult to judge what an unstable structure is about to do next, and gravity has a tendency to keep right on working. It can be tempting to ‘just have a quick look’ but that is not the professional path. Listen to your instincts telling you that ‘this is scary’ and do something about it.

New shoring systems are becoming available that are stronger, more simple to use and more versatile than previous ones. We probably will not have enough of them. Even if we do, the ones we use may have to be left in place for a considerable time before we recover them (they may not even be recoverable) meaning that we have fewer for the next call. The fall-back position is timber. It is relatively cheap, versatile, and safe. The trouble is it can weaken in storage because of rot and insect attack; it can vary in quality (has a structural engineer checked your timber specification?) and it is bulky to transport. It also takes considerably longer to construct timber shores unless your crews are really well practiced.

The solution, of course, is to have both timber and commercial metal shores and a structured training regime.

Getting through the debris to reach the victim is the dirty bit.

The availability of commercial, high capacity hydraulic demolition apparatus has certainly increased in some areas.

Getting through the debris to reach the victim is the dirty bit. The availability of commercial, high capacity hydraulic demolition apparatus has certainly increased in some areas. The earthquake in Christchurch, New Zealand saw particularly good examples of their use. Robotic demolition is also on the increase, but this is probably suited more to the recovery rather than the rescue phase of an operation due to the inherent ‘lack of human’ factor. It is also something to be flagged up in pre-planning: find out what is available and keep up to date. Most commercial demolition companies should be happy to make contacts with rescue professionals – after all they could get the contract to demolish afterwards.

Manufacturers that make commercial building and demolition equipment are increasingly bringing out versions of their kit with rescue in mind. These will incorporate, hopefully, things like a wider gap in handles to accommodate bulky gloves, dust suppression, extra carrying handles, higher visibility, and also a lower price tag . . . well, maybe not.

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A big consideration, and one that rescue professionals should have considered, is the effect of exhaust emissions from gas powered machines. It is well known that you should not operate these in confined spaces, but next time you do some training in the open air put a gas detector near the equipment. The carbon monoxide levels given off by demolition saws can be horrendous. The exhaust gases can easily find their way into the debris pile. Victims may be able to endure a certain amount but you have to be aware of the potential problem.

Siting of generators and pumps should take this effect into account. Recent trends in emission reduction may make this somewhat less of a problem, and there are also products using battery and hydraulic power instead of gas. These, of course, bring their own limitations and safety issues, but battery technology developments are particularly interesting at the moment.

Access systems have developed considerably in the last 20 or so years. Safety considerations have always been a driver of change. Standards are now being laid down which it would be difficult to justify falling below. The area is more regulated than ever before. Working at height has always been a dilemma when on collapsed structures –

Personal protective equipment is also an area that is constantly evolving, with the demand being for better protection, more durable, lighter, warmer or cooler equipment.

you don't really want to be anchored to an unstable wall, for example. The natures of the tasks are such that it will almost invariably be a solution involving personal, rather than collective, protection methods. Recent developments are tending towards simplified, one-bag type solutions, which need less technical know-how on the part of the operator and increased speed of deployment.

Personal protective equipment is also an area that is constantly evolving, with the demand being for better protection, more durable, lighter, warmer or cooler equipment. The integration of several types of protection (for example dust, eye, head and ear) is not solved yet, especially if you use products from different suppliers. Add in factors like operating in contaminated environments and the subject becomes extremely complicated. A useful report on PPE standards, especially relating to exposure to chemical, biological and other nasty environments, is at <http://www.communities.gov.uk/documents/fire/pdf/1779289.pdf>

Communications is an area where there is criticism in almost all debriefs. The demand is for systems that are, above all, reliable. They also have to be robust and capable of operation in severe conditions. This subject does not all need to be about the hardware, though. Site marking is about communication; the use of standard symbols and layouts can act like signal flags on a ship. You do



not have to speak the same language. Good communications results in more efficient searches – the same areas do not get searched more than they have to if you can hand over accurate details of the previous team's work.

It was stated at the beginning that techniques and equipment are developing rapidly. Perhaps more significant is the increase in resources, particularly specialist rescue teams, being seen around the world. In many cases these can be integrated with existing services, building on the experience of many years of fire service operations, for example. Whether this is possible or not, it is important to source equipment and training from organisations that have the experience and knowledge to provide the quality required for such a critical task.

Still on the integration theme, it is possible (and cost effective) to procure equipment that is multi-functional, so that it is not only of use in structural collapse but also, for example, road traffic incidents, using hydraulic rams that link to shoring struts, having airbags that can be used for lifting vehicles, stabilising trenches, and so on.

In some ways the organisations that are just about to embark on setting up a structural collapse capability are lucky. They can draw on the expertise of those who have done it already and compare the different approaches. They are not constrained to procure more of the same equipment solely on the grounds of compatibility, but are able to judge what is the best, most effective kit on the market today and get what they really need and deserve.

Alistair Swift is a heavy rescue trainer with NATEL Heavy Rescue and Emergency Lifting

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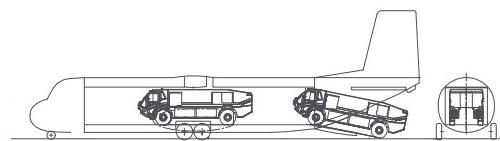


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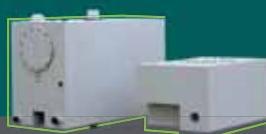
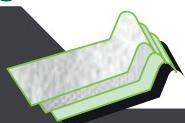


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Industrial Firefighting Calls for Industrial Strength Vehicles

Tom Brandes

A large industrial fire can have dire consequences, including injury, loss of life, large-scale financial loss and environmental harm.

Industrial and chemical fires are among the most dangerous and unpredictable due to the fact that flammable materials such as petroleum, pressurised chemicals, and natural gas are often present, and the need to process these flammable hydrocarbons at high temperature and/or high pressure makes the hazards more severe. Industrial facilities that may have their own specialised fire departments or brigades include operations such as large oil refineries, chemical and petrochemical plants and oil depots.

Industrial fire departments are equipped with specialised firefighting equipment and apparatus that is among the most powerful in the firefighting industry. To look at trends in industrial fire apparatus and the emergence of new firefighting technologies, we spoke with Allen Huelsebusch, who is Industrial Product Specialist with Pierce Manufacturing dealer, Siddons-Martin Emergency Group in Houston, Texas.

Huelsebusch became directly involved in the industrial fire market in 1998 as Pierce was developing its patented Husky industrial foam system. "Pierce was working on the Husky industrial foam system and our team was involved in its development with Pierce engineers because this new system was going to play a major role in our market. We became involved in the first prototype and initial testing. I have been working with industrial customers exclusively ever since," recalls Huelsebusch.

The Difference between Municipal and Industrial Fire Departments

Staffing is one of the biggest differences in the structure of an industrial and a typical municipal fire department. An industrial fire department is most often staffed by volunteers who work in the facility in other capacities but who have been trained as firefighters. Huelsebusch explains: "The



biggest thing is that a lot of industrial departments work with a few dedicated fire and emergency response personnel and large volunteer squads – basically drawing workers off of each shift to provide fire protection in the event they are needed. Then, they will call in back-up resources if they cannot handle the event.” Many of the members volunteer to join the fire department or fire brigades. The main draw is to be able to complete the training through different classes as required in their role in the department. They may receive a little extra overtime compensation but, for the most part, it is a volunteer force to be there to protect the facility.”

Training Takes a Front Seat

“Training is often a challenge for industrial fire-fighting departments,” according to Huelsebusch. “These departments have to meet all the OSHA requirements and safety requirements on the fire service side within their plants. There is a growing emphasis on safety. The biggest thing is, they are dealing with firefighters who are placed in dual roles, and the apparatus needs to be easy and quick to operate.”

“The training has definitely become more organised over the years,” Huelsebusch explains. “These firefighters handle a lot of their training within their own facility by bringing in specialty training organizations like TEEEX (Texas Engineering Extension Service) – a member of The Texas A & M University System, and others that conduct classes at their facility. They also travel to fire schools; sophisticated facilities that offer highly organised live fire training.

In addition to training on large capacity pumbers and foam systems, industrial fire departments have a broad range of additional response requirements. “Along with firefighting, industrial departments have rescue squads that focus on areas such as rope rescue and confined space rescue, because they are potential response issues in any industrial facility, be it a chemical plant or a refinery,” Huelsebusch said.

Bigger Challenges mean Bigger Apparatus Capabilities

From an apparatus equipment standpoint, industrial firefighting requires more robust vehicle capabilities. “The biggest difference is the flow capacity – higher litres-a-minute flow rates are the way everything is going these days,” offers Huelsebusch. “Industrial fire departments require a lot of water – and a lot of foam capability – to be able to extinguish the hotter and larger fires they are forced to deal with. In the refining end of it, the cleaner fuels required by tighter environmental standards mean that they are processing it hotter and under more pressure. This may increase, somewhat, the danger level that they face with fires. When there is a leak, there most likely is going to be a fire. And the bigger fires and hotter fires require more litres-a-minute to mitigate the situation.”

Huelsebusch explains the differing foam requirements of chemical plants and refineries: “Typically, chemical plants don not require as much foam. They do more valving off and controlling fires to keep things cool while they let the vapours and pressurised gases burn off. In these plants you see a lot more polar solvents than you do in a refineries. But they are still going to have hydrocarbons on site, so chemical plants have to be well versed in the use of both. And they have to rely on their vehicles’ foam systems to produce the foam that they need.”

The demand for greater fire suppression capabilities was followed by the introduction of larger capacity foam systems that are effective at lower foam concentrate percentage rates. Huelsebusch recalls, “When I first got started in the industrial market, 2000 GPM pumps were more typical, with many 1250 GPM and even 1000 GPM units. Today, many of the industrial pumps are able to discharge 5000 GPM at 6 percent foam concentration. Most deck guns on industrial vehicles discharge 5000 GPM.

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vehicle by using a reduced foam concentrate flow rate. These are efficient and effective multi-purpose products for hydrocarbon fuel fires (at a 1 percent concentration) as well as on polar solvents such as methanol and isopropanol (at a 3 percent concentration). "If a typical pumper can carry 1000 gallons of foam or an aerial carries 500 gallons of foam, by using the new foams, you basically triple the size of your foam tank. The Pierce Husky industrial foam system, for example, was designed for 1 percent foam, and we were the first foam system that was truly certified to produce 1 percent so it has never been a problem for us."

Newer Safety Features Get a Closer Look

Newer technologies continue to find their way into industrial applications – especially those that enhance safety. Huelsebusch addresses Pierce capabilities and new technologies: "We are seeing a growing demand for – and concentration on – safety features. A typical industrial plant's water system will operate in the area of 150-psi (pounds per square inch) pressure – whereas a municipal fire system is maybe only 50 psi. So, industrial firefighters are dealing with a lot higher incoming

water pressures to allow greater flow through these trucks. In the event of a rupture, this causes serious safety concerns."

In response, a popular option at Pierce is to bring all of the water in on the passenger side of the truck and then discharge it out of the driver's side. The benefit is to keep all high-pressure hoses on one side of the apparatus away from the operator. Moreover, in the unlikely event they lose their plant's water system and have to draft water from a source, all of their hose inlets are on one side of the truck. It just makes that whole operation easier."

Another area of focus is to keep firefighters on the ground as much as possible, and give them safety grab rails whenever they do have to step onto the truck. Pierce has recently introduced a handrail system on its hose-bed covers to help address dangerous situations firefighters face when they are on top of the truck. "We have incorporated aluminium hose-bed covers with crossbars across the front and the rear," Huelsebusch explains. "So when they deploy, it opens up the bars on the front and the rear and forms a safety shelf for firefighters on top of the truck when they are loading hose. This is a new system that meets OSHA requirements, since it forms a rail system around firefighters when they are working on top of the vehicle. It is either that or have them tied to a yo-yo – and that is not feasible on a truck!"

A related upgrade is the latch that opens the hose-bed. "The current technology still requires somebody to get up on top of the truck to open the clamshells of the hose-bed cover," Huelsebusch explains. "Pierce recently introduced a mechanism that we can unlatch. The firefighter pulls one lever from a lower position on the back of the truck and it unlatches the hose-bed covers from the rear tailboard of the vehicle. The system uses pneumatic



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lift cylinders, to open the clamshells, without putting somebody on the top of the truck to do it."

Longer, Lower and Wider

Unlike a municipal pumper vehicle, a typical industrial fire apparatus is not concerned with carrying a large amount of tools and equipment. The available space is primarily focused on maximising foam capacity. "In the municipal world, we try to maximise compartment space but on an industrial rig, they are not carrying that much equipment and compartment size is not that critical. It is important to note that these vehicles carry no or very little water, as it is all foam concentrate. Pierce engineers have made the tanks longer and lower. The rear compartment on a typical municipal vehicle is replaced by part of the foam tank. This reduces hose-bed height and keeps firefighters closer to the ground, and anytime you are closer to the ground, you are a little bit safer. This has the added benefit of lowering the vehicle's overall centre of gravity."

Custom Vehicles Rise to the Challenge

With very large and powerful fire pumps, the fire apparatus chassis placed in an industrial application needs to be super heavy duty to be up to the task. Pierce offers a complete line of custom chassis to meet any requirement. The Pierce Arrow XT and Velocity chassis are extremely popular because they are chassis that are able to house and cool the high horsepower engines required for industrial fire operations. Huelsebusch explains, "We have to run the highest horsepower engines available to drive the big pump and the foam system. These big engines with more than 500 horsepower create a lot of heat. A custom chassis like the Arrow XT and the Velocity are most popular in the industrial world because both of them have no problem cooling the big engines. Keep in mind these trucks may be standing still and pumping for hours and possibly days on end at a large scale event."

In addition to large deck guns, many industrial departments specify aerial platforms and ladders.

The aerial streams they generate are often used to cool adjacent structures around a fire to keep them from deforming and possibly failing while the fire is allowed to burn itself out. In many cases, especially with pressurised gases, industrial firefighters do not want to extinguish the fire. Instead, their goal is to keep surrounding structures cool while they "valve out" the fire and allow the fuel to burn off. Huelsebusch explains, "Because these plants are so tight, the incident might not be next to a road. If you are on a traditional pumper with a big deck gun discharging, you have to first shoot up and then rain down on your target. Conversely, on an elevated stream you can get up above many obstructions and place the agent directly where you need it. And if you have a fuel tank type fire, these tanks are getting bigger and bigger, with 300 foot diameter tanks becoming the norm. With tank walls that are 60 feet tall, if you can launch this larger stream from the tip of an aerial device, you will be able to carry it much further."

Pierce offers an aerial platform that is able to achieve 3000 GPM flow through the aerial platform and super heavy duty ladder. The advantages for an industrial fire department are significant. "We are seeing more interest in large, elevated stream. We were able to achieve 3000 GPM of flow on a 100-foot platform and the 100-foot super heavy duty ladder. Both of those are capable of discharging 3000 GPM."

Due in part to the time length of a large-scale industrial emergency, another innovation that has proven to be popular is an enclosed and air-conditioned top mount pump operations area. Huelsebusch explains, "Industrial incidents are not just an hour or two like we see in the municipal world; these firefighters can be at the scene for days. Being able to get firefighters into a controlled environment, especially in hot climates like is very important as we are dealing with heat just as much as northern climates deal with cold. Firefighters are using these spaces for rehab as well as pump operations."

As industry needs evolve, fire apparatus manufacturers must anticipate these requirements. **IFF**

Tom Brandes is a freelance writer working in the fire and emergency services sector.

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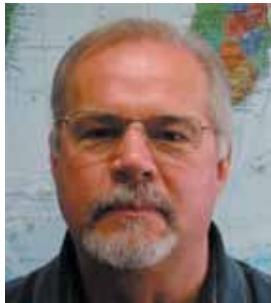
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Thomas J. Ruzich

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Will It Make The Cut?

The need to cut specific materials during rescue and firefighting is unlimited, but fast, safe and successful results depend on using the right saw.

Earthquakes, tsunamis, hurricanes, typhoons, tornadoes, floods, structural collapse, terrorist attacks, military actions, structural fires, vehicle accidents (buildings, trees, autos, trucks, buses, trains, aircraft, heavy equipment), the list is endless. But one thing they all have in common is the need to cut something in order to search for victims, make a rescue, force entry, ventilate, extinguish a fire, or clear an area. So, this article focuses on two types of saws: chain saws and rotary saws. Rotary saws are also commonly called disc saws, cut-off saws, chop saws or power cutters.

Safety, speed, ease of use and versatility are important factors not only to the saw operator, but to the trapped victim and nearby rescue personnel. The chain saw and the rotary saw both have exposed cutting implements – the cutting chain on the chain saw and the cutting blade on the rotary saw. The cutting implements on both saws are sharp and turn at a very high rate of speed, so caution is needed when operating these saws. A few manufacturers offer saws with guards covering the chain or blade and these can be very useful for both protecting the operator, allowing the depth of cut to be set to a predetermined depth – to protect against cutting through structural components that could weaken the object being cut, and to protect the trapped victim from accidental contact with the chain or blade.

The rotary saw, when equipped with an all-purpose vacuum-braised diamond blade, will cut virtually any material encountered at a rescue or fire. But, because the cutting blade is a round disc, the depth of cut is limited. A 356mm diameter blade can cut only 127mm deep. A chain saw

however, can cut the full length of its bar and chain, so a 510mm chain saw can cut the full 510mm deep. Chain saw chain made with carbide inserts – carbide-tipped chain – is capable of cutting most materials except ductile iron and concrete. Chain saw chain made with diamond segments and run on a dedicated chain saw with special features, including water lubrication rather than oil, can cut reinforced concrete.

Yes . . . you read that correctly, a chain saw that cuts concrete! Even though the carbide-tipped equipped chain saw can cut light gauge sheet metal and the diamond-segment chain-equipped chain saw can cut the reinforcing metal within concrete, neither chain saw can routinely cut metal. Therefore, the need exists for a well equipped fire brigade or rescue team to carry multiple saws to insure that they are capable of cutting all the materials they may encounter at the fire or rescue scene.

Chain saws and rotary saws are not new to the fire service. Rotary saws have been in use for the last 40 years, and there are documented cases of the chain saw being used in the fire service as early as 1953. The rotary saws gained popularity in the fire service first using abrasive blades, and then with carbide-tipped blades and now diamond blades. The chain saw took much longer to become established as a viable fire rescue tool because the chain became dull very quickly when material other than clean wood was cut. It was not until 1966 when a Los Angles, California fire Captain, Martin Bullard, patented a method for attaching a piece of carbide to a chain saw cutter, that chain saws started to gain acceptance in the fire service.

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However, not until 1985 when another California firefighter, Tom Ruzich, developed a more secure method for attaching carbide to a chain saw chain cutter, patented a combination guard depth gauge, modified a chain saw engine to turn the chain faster and to operate in hot-smoky conditions, did the use of chain saws in the fire service finally became accepted. In 1993 Ruzich went on to develop and patent a unique carbide cutter design, the Bullet Chain, which still remains the state-of-the-art for fire rescue chain saw cutting.

Both the chain saw and the rotary saw can be powered by gasoline-powered two-cycle engines, hydraulic motors, electric motors, or pneumatic motors. Over the past forty years, experience with chain saws and rotary saws has proven the gasoline-powered and the hydraulic-powered saws to be the best choice for fire rescue cutting. The gasoline-powered saws are the most popular and currently comprise up to 90% of chain saws and rotary saws in use. The hydraulic-powered saws make up the majority of the remaining 10% with a scattering of electric and pneumatics powered saws mixed in.

The gasoline-powered saws are most widely used because of their rapid deployment, ease of use, and unencumbered versatility. However, the gasoline-powered saws are loud, up to 104 decibels and produce harmful exhaust fumes, so use in a confined area, especially without ventilation, should be a consideration. Confined space is a good choice for the hydraulic-powered saws, and the amount of cutting and type of material also should be considered. Generally, hydraulic-powered saws are better suited to sustained cutting scenarios.

So, what are the factors that go into the decision of what saw to use? Let's break this down into two basic categories; firefighting and rescue.

Firefighting operations

Wildland firefighting, forest fires, brush fire and other wildland/woodland fires, when taken together or separately, without question require the chain saw.

In fact the best suited saw is a standard gasoline-powered chain saw with standard (non-carbide) wood cutting chain. Cutting trees is what the chain saw was designed for and even though extreme heat and smoke may be encountered, the ambient atmosphere is generally sufficient to support the operation of a standard chain saw without any air intake modifications and running a standard wood cutting chain.

There are many manufacturers of standard chain saws and a good quality chain saw will get the job done. However, this is where size matters, or more aptly, power matters. Let us say that for the area of responsibility your geographic territory covers, a 510mm cutting length is the size you need.

There are chain saws with a 510mm bar that are powered by a 45cc engine, and there are chain saws with a 510mm bar that are powered by a 70cc engine. Power, weight and cost become considerations, so be very specific in your specifications, so you are sure you are getting a chain saw with enough power to get the job done.

Structural firefighting presents a different set of circumstances. The purpose for the saw in structural firefighting is to cut ventilation openings, force entry into the structure, open up areas to check for fire extension, overhaul, and to provide speedy intervention if a rapid intervention team is deployed. The atmosphere the saw may operate in at a structure fire can be extremely hot and smoke laden, and smoke generated during a structure fire can include unburned gases. These gases can be lighter than air and will easily flow through a standard saw's air filter.



The Bullet Chain



During structure fires (and cutting concrete at rescues) water and steam can also penetrate standard filter elements. Remember a standard chain saw or rotary saw is designed to run in fresh air atmospheres. The air filters on these standard saws generally do not fare well in hot smoke laden atmospheres, and chain saws require a stronger more versatile carbide-tipped chain to cut the many different building materials that will be encountered. Structural firefighting is where value added features like large multi-stage external air filters, guards/depth gauges and special carbide-tipped chain saw chains, carbide tipped and diamond rotary blades are required.



Rescue operations

Rescue cutting encompasses every other cutting requirement there is. From cutting through multiple types of materials in a building collapse, fallen trees, crumpled cars, trucks, busses, trains and, aircraft to metal-reinforced concrete. Think about all

the different types of materials that can be encountered at a building collapse. The cause of the collapse also makes a difference in what needs to be cut. For example, a building collapse caused by an earthquake will include the building materials themselves that need to be cut, such as wood, metal, plastic, sheet metal, concrete, wires, pipe and so on. But, in an earthquake followed by a tsunami, there will be all of these materials, but now they are covered in a layer of mud, stone and other debris.



Here in the Pacific north-west area of the United States there are interstate highways that traverse mountain passes that frequently experience extreme winter storms. These roads are major transportation routes for trucks hauling virtually every commodity imaginable. The combination of these tractor trailer trucks, some three trailers long, weighing over 45,000 kilos and icy roads with almost inaccessible ravines below can create challenging rescues.

Imagine a tractor trailer hauling 32,000 kilos of frozen meat. The truck slides off the side of the road and over the edge of a rock precipice coming to rest in a canyon 50 meters below. The trailer loaded with the frozen meat crushes the passenger compartment of the truck, trapping its two occupants. There is no road for emergency vehicle access down to the crushed truck, the closest crane and tow truck is over three hours away because of the major blizzard that caused the crash, and the hydraulic cutters and spreaders that you lowered down to the wreck just cannot contend with the enormous volume of material.

Both a rescue chain saw with a carbide-tipped bullet chain and a rotary saw with a diamond blade can be used here. Materials needing to be cut include metal, aluminium, plastic, glass-fibre and frozen meat. The rotary saw will cut all the metal and some of the aluminium superstructure. The chain saw will cut the aluminium trailer siding, the plastic, the glass-fibre . . . and the frozen meat.

Fire rescue technology continues to innovate and grow, and we have a tendency to gravitate to new technology because we are always looking for a better way. Sometimes new technology and innovation is simply applying existing tools to new applications.

Thomas J. Ruzich is
President of Cutters
Edge/Edge Industries, Inc.



The rotary saw is a hand held engine or motor that drives a circular blade

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Attendees going through a briefing by an Academy instructor before a Phase 3 PPV scenario. Picture courtesy Mark Bathard



Training with Devon & Somerset Fire & Rescue Service (DSFRS)



Mark Bathard

DSFRS a brief history

Devon & Somerset Fire Service is the fifth largest fire and rescue service in the UK and boasts the largest non metropolitan service in the country. The service was formed in April 2007 which was the merger of Devon fire and rescue and Somerset fire and rescue services. The Somerset service, which was previously known as Somerset Fire Brigade was formed in 1948. Devon Fire Brigade was formed in 1973 by the amalgamation of Exeter City Fire Brigade, Plymouth City Fire Brigade and Devon County Brigade; it then became Devon Fire and Rescue Service in 1987. The service employs over 2300 staff, which includes over 800 whole time firefighters, 1200 retained firefighters and about 250 non-uniformed staff.

The Academy

Earlier this year, DSFRS launched its Training Academy with the aim of providing first class training that is available to other fire and rescue services as well as commercial clients. There are seven schools within the Training Academy that are developing and marketing training, the schools are:

- Fire Behaviour School.
- Access and Rescue School.
- Fire Fighting School.
- Fire Safety School.
- Maritime School.
- Driving School.
- Command School.

The Fire Behaviour School, based at Exeter Airport, has long been delivering BA and fire behaviour training to Devon and Somerset firefighters with over 2500 people being trained in the last two years alone. Some of the courses offered by the Academy are now BTEC accredited; they include Fire Behaviour Training Instructor and Positive Pressure Ventilation Instructor courses.

The Fire Behaviour School has trained personnel from 43 UK Fire and Rescue Services and representatives from Ireland, Sweden, Colombia and Brazil (see DSFRS article on Colombian Fire Fighter training in the last issue of IFF) They have served the power generating industry, aircraft manufacturing and airport fire services from the commercial sector and look forward to delivering bespoke courses to new and diverse sectors.

In 2013 a new training facility will be built adjacent to the existing site at Exeter Airport and in partnership with the Airport. The Academy has already taken on an extra three instructors and the new facility will boast an aircraft simulator, a foam training facility and a new extended search and rescue villa and high rise facility. DSFRS will work closely with the Airport fire fighting team to look at ways that they can jointly deliver training in the future to other services and airport fire teams.

Rescue 3 (UK)

Rescue 3 (UK) is a leading provider of technical rescue training in the UK and Ireland. Having

Fire Behaviour training units. Two more units from Kenex Engineering have been supplied to cope with demand.

Picture courtesy Mark Bathard



trained over 4000 students in technical rescue including personnel from the Fire and Rescue Services, Ambulance, The RNLI, Mountain Rescue Teams and the AA. Rescue 3 (UK) is now enhancing its training provision through the formation of a new regional training centre in the North East of England and through a strategic partnership with Devon and Somerset Fire and Rescue Service's Access and Rescue Academy.

PPV Training

One of the courses offered by the Academy that is BTEC accredited is their Positive Pressure Ventilation Instructors Course. Mark Bathard, International Sales Manager from International Fire Fighter Magazine spent a day with the instructors at the Fire Training Academy to see what this world class facility can offer.

Six attendees were taking part in the instructors' course that were from The Isle of Wight, West Yorkshire, Gloucestershire and County Durham and Darlington Fire & Rescue Services. Before any "live" demonstrations could take place, briefings took place in the classrooms which would be about the science behind Positive Pressure Ventilation. The Academy has only recently started offering courses in PPV and they have already invested heavily in state of the art equipment. One of these impressive pieces of kit is a Haagen Fire Training Products PPV Trainer. This rather amazing simulator allows students to simulate a scenario where a house or building is full of smoke with various outlets and inlets so that students can decide which would be the best point of entry and where also, best place the PPV Fan. Smoke is pumped into the simulator and then miniature fans are placed by an entry point whilst vents are opened by means of small levers to allow PPV to take place. As the whole simulator is clear, it allows students to really see the effect of ventilation.

Once the classroom sessions had finished the attendees got kitted out in full bunker gear and breathing apparatus ready to do battle with a live



PPV Trainer. Picture courtesy of Haagen Fire Training Products

fire PPV scenario. The Academy teaches PPV in three phases. Phase 1 is when PPV is used during the closing stages of an incident normally after the fire has been extinguished. This is often referred to as smoke clearance or post fire ventilation. In this scenario, the use of PPV substantially reduces the time taken to remove the heat and smoke from a building where the fire has been extinguished. Phase 2 is when crews are competent in the application of PPV during the closing stages of an incident, PPV can then be introduced while the fire is still burning but is controlled. An example of this case is when the crew have located the fire and suppressed it but not necessarily completely extinguished it to the point where there is nothing but cold ashes remaining. Phase 3 is once again when crews are competent in the application of PPV while the fire is still burning but not under any control, brigades can consider the introduction of PPV in the initial stages of an incident, on first arrival or prior to committing BA crews. This phase requires a greater degree of experience from the Incident Commander as they must first be able to establish the effects of PPV with little knowledge of the internal layout, and no crews inside the building to provide them with feedback.

The Academy's instructors prepared the building and lit the fire inside. While heat and smoke was building up inside, the attendees were busy going through safety checks and buddy checks. Once this had been completed the Incident Commander who previously in the classroom had explained how he wanted the scenario to be approached chose his BA team who would enter the building. He would remain on the outside in constant contact via radio with the crew inside the building while another attendee was ready with a PPV fan at the point of entry.

The Academy as mentioned earlier has invested in equipment specifically for the PPV instructor courses. Instructors from the Academy recently travelled to France where they visited a leading European PPV manufacturer Groupe Leader, the Academy currently has two of the Leader Fans. They also have two fans from US manufacturer, Tempest.

After the scenario had been completed, the attendees were rotated so that there would be another Incident Commander, a new set of BA crew and a new PPV operator. Once this had also been completed attendees went back into the classroom to discuss with themselves and the instructors at the Academy how they thought they got on. The instructors who during the scenarios acted as observers noted any actions that could have been improved on or to comment on any things during the scenario that might have been missed.

In Conclusion

The PPV instructors' course which as mentioned earlier is just one of many courses offered by the Academy just demonstrates what a world class facility DSFRS has. Apart from teaching other brigades from around the UK as well as the rest of the world, DSFRS heavily involves itself with community activities and travels to various places throughout the UK the most recent being the Royal Bath & West Show in Shepton Mallet Somerset, to convey to the general public the message about fire safety within the home and the value of every home having a fitted smoke alarm. Keeping people aware of the importance of how dangerous fire can be is our primary concern and we will strive to do this and make Devon and Somerset safe.

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Lighting the Way

There has never been a more advantageous time to apply technology and performance to a fire fighter or rescue worker's personal lighting tools. Today's firefighter is responsible for more equipment than ever before. Due to the burdensome amounts of gear required to do the job, anything that allows for lighter and smaller profiles would certainly be welcomed.

One of the latest technological advances has entered into lighting tools, that being the transition from incandescent to the use of LEDs (light emitting diodes). LEDs have come a long way, transitioning from indicators to illuminators. We can all identify with the various uses of LEDs in our everyday life. It can be the little red light that shows your TV is on, the green light that tells you your computer is running or the blue light that reminds you your laundry is done. Today, we are seeing increased applications such as LEDs in traffic signals, tail lights of cars, trucks and buses as well as emergency lighting for fire, police and other emergency vehicles. These are all indicators.

There are many benefits that come with LEDs: they are not nearly as fragile as incandescent lamps, do not have a minimal life expectancy (some incandescent torch bulbs carry a life of 30 hours compared with 50,000 hours for many LEDs), are more efficient with batteries and do not produce the high temperature levels seen with incandescent models.

With these added applications came a surge

of attention by the LED manufacturers who have developed LEDs to go beyond being solely an indicator and become an illuminator. In the not too distant past the very first LED torches were small, amazingly bright keychain type lights (for an LED) that allowed for close-up uses like reading a document, lighting walk spaces, looking for keys in a purse or reading a menu in a romantically lit restaurant. The performance level achieved from LEDs used in personal lighting tools today have surpassed that of the previous versions and are looking to send the incandescent down the same path as the dinosaur and VCR. However, it is important to note that many of the legendary (incandescent) torch designs continue to serve a worthy purpose, as they maintain a price advantage over LEDs.

This technology has not only allowed for performance increases of upwards of four to five times the lumens, but has brought with it the ability to create new categories in lighting tools. LEDs are bright enough now to be used in portable area lights, which offer solutions never before seen.



Not only are the lights cool-running but very durable. Mixed with a self-contained rechargeable battery, they allow for the elimination of generators, which bring extra bulk, fuels, exhaust, noise, cables and heat concerns.

In addition to the ever-increasing light output, the technology has allowed for increased efficiency of LEDs, which brings longer run times. So we are now seeing increases in lumen output and at the same time, seeing longer run times. This was perceived as impossible in the past, but due to electronic drivers used in LEDs, it is now a reality.



Another topic crucial to the fire fighter and rescue person is lighting safety approvals. Because there is the potential for responding to any number of scenarios, it becomes prudent to consider a safety-approved light. Due to the wide variety of environments there are a wide variety of approvals. All details regarding safety approvals are not covered in this article. Basics are provided and it is strongly recommended that further information be sought.

There are a variety of standards that exist and vary from country to country but we will use North America as a reference. Hazardous locations are categorised following guidelines set down in the NEC (National Electric Code), by four criteria: Class – defines the nature of the potentially hazardous materials that are present; Division – classifies the likelihood of sufficient concentrations of the hazardous materials being present to pose a risk of fire or explosion; Group – categorises specific hazardous materials within each class by similarity of their properties or characteristics; and Ignition Temperature – categorises hazardous materials according to the temperature at which they will ignite. One very good resource for a more in-depth explanation on safety approvals can be found at <http://www.Peli.com/en/torches-hazardous-areas.php>. There, you can review and download a safety approval white paper.

For some time, there has been a need to create a performance standard. In the past you may remember seeing torches reported in candlepower. This created a problem when trying to determine the performance as manufacturers were using a variety of different reporting methods and most end users were unaware of any candlepower rating system. Today torches are being reported in lumens, which is a measurable unit via a light sphere. The need for additional performance reporting such as run times, beam distance and water ingress, set the stage for a standard to be established.

So, in 2009 a variety of torch manufacturers collectively came together and created the first such standard, called the ANSI (American National Standards Institute) / NEMA (National Electrical Manufacturers Association) FL-1 standard. This standard covers a variety of performance areas, namely: light output, run time, beam distance, peak beam intensity, impact resistance and water resistance. There are icons used to reference each performance area and are identifiable by the ANSI FL 1 branding. This standard is adopted on a voluntary basis and is self regulated. It has proven to be of great value and can be referenced by any end user for consistent, reliable and comparable performance figures.

Lighting Options

There are multiple applications for torches in the fire and rescue workplace. Some of the more common types are head lamps, hand held, right angle (hands-free) and lantern style lights. When selecting a torch you should consider the size, weight and performance of each. Again, today the technological advances have allowed for smaller, lighter weight, yet higher performance models.

Handheld models come in a variety of shapes and sizes but AA (typically three to four cells) and C (typically two to three cells) alkalines are the common batteries of choice. There are a variety of switch designs to consider. Some are one-hand activated where others require two hands to activate but typically will offer a higher level of water ingress protection. Another innovative feature is the use of photoluminescents (glow in the dark materials) that help locate an accidental loss of a torch in the off position.

When considering a head lamp, it is best to avoid too heavy a model as it may put undue stress on your neck. An articulating head is beneficial because it allows the beam to be adjusted to the sought after angle. High beams and low beams are also a value as too much light in close up applications may be self-blinding and an unnecessary waste of battery life. Depending on preference and helmet style, a wide variety of straps and side attachments are available as the most common ways to secure it.

Lantern style torches typically are heavier and larger in size but have the ability to produce a brighter light beam and supply a longer run time. There are lantern style torches now available that are substantially lighter in weight (3 times lighter in some cases), yet produce industry leading lumen performance. A lantern style torch should enable a better penetrating beam for smoke filled conditions, use in crawling situations and can be used to mark an egress location, identifying a safe exit.

Right-angle torches are designed to offer a hands-free application. Certainly, there are many times when two hands are needed. In these situations, you are able to keep a path illuminated while working with other equipment. Some of the latest designs in right-angle torches offer multiple features such as high/low beams, downcast and signalling. The high beam would be used for maximum illumination where the low beam would allow for a reasonable amount of light but extend the battery life. The downcast light is used to illuminate a path to minimise stepping into any



unwanted areas, as well as used when reading or writing reports without a blinding effect. Signalling, also a benefit, can be used in a variety of applications.

Another noteworthy feature you will now see on firefighter and rescue worker torches is battery level indication. Seeing how the torches used in our industry are truly "tools of the trade" and instruments we rely on, it makes sense to have some form of battery level indication. You will see some torches have an illuminated switch that supplies the battery level with varying degrees of colour. For example, green would represent 100 percent to 50 percent, amber would represent 50 percent to 25 percent and red would represent below 25 percent. Other designs will have multiple LED indicators that diminish with use. Still others offer a flashing signal to indicate a low battery level. Regardless of the type, battery level indication is of great value.

Beyond head lamps, hand held, right-angle and lantern lights is portable area lighting. Portable area lighting systems of the past were powered by noisy, polluting, fuel-driven generators that emitted toxic fumes and heat, posing serious safety problems at emergency sites. A superior alternative is area lighting that offers users the ability to illuminate large work areas without the fuel consumption, noise and air pollution associated with industrial diesel generator-powered lighting towers of the past. Lighting up ravines, confined spaces or any other place your apparatus can't go is made easy with the right area lighting system.

Now, more than ever, lighting products include increased options with improved performance and additional features, which makes it all the more critical to take extra care when choosing personal lighting tools. It could literally mean life or death for you and those you work to protect.

Scott Jones is Director of Product Management in the lighting category for Peli Products

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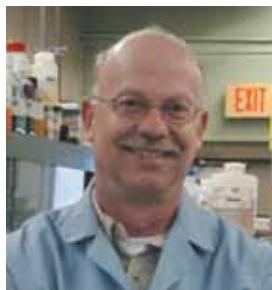
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The Fluorinated versus Non-fluorinated Foam Debate



Mitch Hubert

Dynax Corporation

Over the past several years a debate has raged over the use of fluorinated versus non-fluorinated foam. Much of the debate has centered on the environmental acceptability of fluorine- foams and their long-term viability in the market.

During this time, much confusion and misinformation was spread about the type of fluorine that is being used, and the environmental fate of the fluorine that is being used. At present, the C6 fluorotelomers that are being used have gone through a whole host of testing to determine the ultimate fate and risk in the environment. These data have been presented at a number of conferences and in a number of scientific journals, and by now should be sufficient to allow environmental and toxicological professionals to come to independent conclusions relative to the acceptability or non-acceptability of the risk associated with the use of fluorine-containing foams. Certainly, the risk profile for fluorine-containing foam appears to be quite acceptable by most measures being employed today.

What seems to be lacking in the debate so far is the relative effectiveness of fluorine-containing foams versus fluorine-free foams and what must be taken into account when choosing to use one over the other.

What is lacking in the debate is the relative effectiveness of fluorine-containing foams versus fluorine-free foams, and what must be taken into account when choosing to use one over the other.

Fluorine-containing foams have a long history of successful extinguishments of major fires throughout the world. As such, it is relatively easy for a trained professional to make an informed decision regarding the use of fluorine-containing foams. The decision is not so easy for fluorine-free foams. Most of the data that supports the use of fluorine-free foams has been based on performance fire testing using small scale fires. The problem with using only this type of information to decide on which type of foam to use is that the fire tests are carried out under controlled conditions and using foam qualities that are difficult to obtain with conventional air aspirating foam hardware such as branch pipes or foam pourers.

Also missing in the debate is one of the properties that makes fluorine-containing foams so effective. One often sees articles and hears about the film forming capability of fluorine- containing foams such as AFFF and FFFP and how the ability to form a film makes this type of foam so effective. And, indeed, this is a major advantage that fluorine-containing foams exhibit. What is missing however is the second important property that the use of fluorochemicals brings to firefighting foam. That property is the ability to shed fuel as the foam is applied to the surface of a burning hydrocarbon fire. This ability to shed fuel or resist fuel contamination of the foam blanket is called oleophobicity (Quite literally "oil fearing or oil hating").

Perhaps the best way to describe oleophobicity is to look at what would happen if we were to place a single bubble of a fluorine-containing foam versus a single bubble of fluorine-free foam on the surface of a hydrocarbon fuel such as kerosene or petrol.

The fluorine-containing foam bubble will try to repel any of the hydrocarbon fuel because of its

oleophobic nature. The fluorine-free foam on the other hand uses detergent-type surfactants that actually attract the hydrocarbon fuel. They are called oleophilic (Quite literally "oil loving"). A single bubble of a detergent-based foam will act much like the wick on a kerosene lamp. Before long it will actually be flammable as the hydrocarbon fuel wicks up along its surface. In fact, the reason that detergents are used in cleaning applications in the first place is their ability to emulsify grease and oils and free them from the surface of whatever is being cleaned; be it your automobile, your clothes or your dinner dishes.

So, how do fluorine-free foams work to control or extinguish a fire? Quite simply, they rely on a

very stable foam blanket to be placed on the surface of the burning fuel. At the immediate interface between the foam blanket and the surface of fuel there is a layer of contaminated foam bubbles that will readily burn. However, a good fluorine-free foam will have a layer of uncontaminated and very slow draining foam to cap over the contaminated foam and so prevent that contaminated layer from burning. This is essentially the same way in which regular protein foam has worked for years.

The use of air aspirating discharge devices of course means that the range of that device is limited by its flow rate and operating pressure. This is in contrast to a fluorine-containing foam that may be applied through non-air aspirating discharge devices. In fact, much of the foam application for fluorine-containing foam is through non-aspirated variable pattern water nozzles. The use of this type of nozzle provides maximum range as all the energy of the system goes into range rather than stealing some of the energy to aspirate

Fluorine-free foams must be applied as gently as possible in order to avoid contamination of the foam blanket. As the flow rate of the discharge device increases so does the impact velocity of the discharge stream. When one gets up into high flow discharge devices, the impact velocity of the stream onto the fuel surface can get extremely high.

The key here is to produce a very good quality foam and to apply it as gently as possible so as to minimise the amount of contaminated foam. This makes fluorine-free foams very effective on small to medium sized fires and especially spill type fires rather than fuel in depth fires. The firefighter, since he needs good quality foam, must use air aspirating branch pipes or nozzles or other discharge devices.

the foam. It is a general rule of thumb that, with air aspirated discharge devices, as the foam quality goes up the range of the device goes down.

The fact that fluorine-free foam requires good foam quality and so requires an air aspirated discharge device brings with it some logistical fire ground considerations that must be evaluated.

First and foremost, the firefighter will be required to get closer to the fire. Obviously, the



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further away a firefighter can get from the blaze the better off he or she will be. In contrast, when using a fluorine-containing foam, not having to use an air aspirating branch pipe or nozzle will allow the firefighter to use a conventional variable pattern water nozzle. The use of this type of nozzle brings with it the ability to go to a fog pattern. If there is a thermal event, a firefighter using fluorine-containing foam can always go quickly to a fog pattern and back away from the fire. This would not be possible for a firefighter using an air aspirated branch pipe or nozzle.

Fluorine-free foams must be applied as gently as possible in order to avoid contamination of the foam blanket. As the flow rate of the discharge device increases so does the impact velocity of the discharge stream. When one gets up into high flow discharge devices, the impact velocity of the stream onto the fuel surface can get extremely high. For spill fires this is not too big an issue but for fuel in depth fires, such as might be encountered in a fuel storage tank or a bunded area, the submergence of the foam stream beneath the fuel surface can result in a large amount of foam that becomes contaminated with the fuel.

Remember, fluorine-free foams are not oleophobic. This can make extinguishment very difficult if not impossible under these conditions. Certainly the time that foam would have to be applied would be expected to increase significantly under these conditions. This means more foam concentrate would have to be positioned and used at the fire and the water supply must be sufficient to account for longer discharge times. Application rates may also need to be higher with fluorine-free foam as compared to fluorine-containing foam but this would have to be determined as part of a large fire pre-plan.

Fluorine-containing foams are available for proportioning at 1 percent and have been successfully used at this proportioning ratio on large fires.

Another logistical issue associated with using fluorine-free foam on large fuel in-depth fires would be the amount of concentrate that would be required on the fire field. The fact that application rates may need to be higher and discharge times may need to be longer were already discussed above. These mean both larger quantities of foam concentrate would need to be brought to the fire and must be staged near the proportioning equipment. The other consideration for supplying foam concentrate to the fire scene is the mix ratio or proportioning ratio of the foam concentrate.

Fluorine-containing foams are available for proportioning at 1 percent and have been successfully used at this proportioning ratio on large fires. Fluorine-free foam is not available as a 1 percent concentrate; it is available as a 3 percent concentrate. However, this fact alone means that at least three times as much concentrate will have to be

moved to the fire scene and staged near the proportioning equipment and in reality, probably more to account for higher application rates and extended discharge times.

In the final analysis, either fluorine-containing or fluorine-free foam can be used successfully on flammable liquid fires. The firefighter must, however, be aware of the logistical and safety issues that come with the use of fluorine-free foam.

For small to medium size spill fires either type of foam concentrate can be deployed successfully with about the same outcome. But, as the fire size increases and the depth of the fuel increases, more attention must be paid to overcoming the logistical and safety issues surrounding the use of fluorine-free foam on this type of fire. And, as with all firefighting, success or failure depends on the knowledge, skill and training of the firefighter.

Mitch Hubert is Vice President of Marketing at Dynax Corporation

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**Ivan Rich**

Bristol Uniforms



Safety at Sea

Despite the existence of marine safety standards since 1914, it is only in recent years that fire has been addressed in the regulations.

In the modern era, safety at sea has become a well regulated, internationally recognised aspect of all forms of marine activity. For many years, until the seas and oceans became the location for many forms of economic activity, safety was largely confined to protecting human life aboard ships. Today, throughout the world, marine activities include fixed and floating rigs and platforms associated with gas, oil and other mineral exploration and extraction both on the sea bed and in deposits of valuable hydrocarbons and minerals well below the ocean floor. This activity now extends well beyond coastal waters into the deep oceans as well as below the ice in Polar regions.

The origins of marine safety standards date back to 1914 when the first SOLAS (Safety of Lives at Sea) Convention was held in response to the Titanic disaster of 1912. For the next 60 years, subsequent SOLAS Conventions in 1929, 1948 and 1960 continued to focus on improving the design, materials and construction of vessels. Fire safety requirements were minimal and certainly

were inadequate for passenger ships.

It was not until 1974, following that year's SOLAS Convention, that the first references to fire extinction were embodied in new regulations in a new chapter II-2 which specifically covered fire protection, fire detection and fire extinction which came into force in May 1980. Even at this point, reference to firefighting was limited to broad considerations of the means of containment and extinction of any fire in the space of origin and protection of the means of escape or of access for firefighting purposes.

It is less than 10 years ago that specific regulations were introduced into the 2002 revision of the 1974 Convention. In July of that year detailed regulations relating to marine firefighting were embodied in a much-expanded chapter II-2 that incorporated a part C covering the suppression of fire and, within it, Regulation 10 on firefighting.

Within this regulation (section 10) on firefighters' outfits, requirements are set out as to the mandatory minimum levels of on-board equipment

MARINE STANDARDS

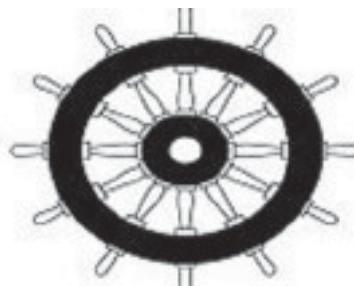
including types of firefighter clothing, number of ensembles required according to the type of vessel and their storage. It is worth noting that obtaining buy-in to international regulations that require the adoption of such a wide range of basic principles and practices is a lengthy process but that, by 2002, the 1974 Convention, along with its various amendments, had been ratified by 141 countries representing over 98 percent of world merchant shipping tonnage.

It is less than 10 years since specific regulations relating to marine firefighting were introduced into the SOLAS Convention.

The IMO (International Maritime Organisation) has its origins in 1948 when it was set up by the United Nations as a specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. The SOLAS treaty was adopted by the IMO in 1968.

Different standards apply in different parts of the world. At the present time, Europe is regulated by the Marine Equipment Directive (MarED) (the EU's Council Directive 96/98/EC on Marine Equipment) and is the group which coordinates the

various Notified Bodies assigned by European Union member states to carry out conformity assessment procedures enshrined in the MarED. This procedure confirms that the equipment has been type tested and approved, which authorises the manufacturer to affix the mark of conformity (wheelmark) to the equipment. This is recognised across Europe.



In the USA, standards are provided by the US Coast Guard (USCG).

In 2004, the European Community and the United States signed a Mutual Recognition Agreement (MRA) on marine equipment, under which designated equipment certified as complying with the Marine Equipment Directive (MarED) 96/98/EC would be accepted for sale in the US without the need for additional testing or certification and vice-versa. This agreement aims to simplify matters for manufacturers that wish to have both MarED certification and USCG type approval,

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allowing them to reach multiple markets on the basis of compliance with one set of regulatory requirements instead of multiple ones, leading to a reduction of costs in terms of testing and certification. This MRA does not currently extend to include firefighter PPE.

In Australia, the Australian Maritime Safety Authority (AMSA) represents Australia at the IMO and, for the most part, adopts IMO regulations and standards for its own shipping and marine regulatory frameworks. In relation to fire safety, it adopts the standards requirements set out in Chapter II-2 of SOLAS which were most recently adopted in November 2009 under its Maritime Orders Part 15 (issue 5) which covers fire protection, detection and extinction.

The first standard to be adopted by the IMO relating to 'Clothing to protect against heat and flame', commonly used for marine firefighting, was in 2008 embodied in standard EN ISO 11612:2008 (superseding ISO 11612:1998) which was itself based on the earlier European Standard EN 531:1995 'Protective clothing for workers exposed to heat'. This standard was part of a set of three that related to different industrial activities in which workers are exposed to various forms of heat and flame.

Firefighter clothing standards can appear quite complex, given the different regulations that apply around the world. Some harmonisation has been achieved through the mutual recognition agreement between MarED and the USCG.

EN531/EN ISO 11612 requires the use of FR fabrics or clothing which neither ignites nor forms a hole or melts when exposed to flame. This standard also has various levels of heat transmission protection from potential burn injury. The highest level, normally used in marine firefighting clothing, requires a multilayer PPE construction. A number of modifications were made during the three years taken to draft EN ISO 11612 from EN 531. These included gaiters in addition to coats, trousers and hoods as well as test methods for performance requirements, which were introduced for tensile, tear and burst strength. Tests for seam strength and seam flammability were also included.

Firefighter clothing standards can appear quite complex, particularly given the different regulations that apply around the world. Some harmonisation has been achieved through the mutual recognition agreement between MarED and the USCG. The IMO and SOLAS regulations are widely used by many countries around the world as reference points for their own marine safety regulatory frameworks.

Within the MarED, confusion was created in 2009 when, in Annex A on firefighter close proximity protective clothing, changes in the 4th



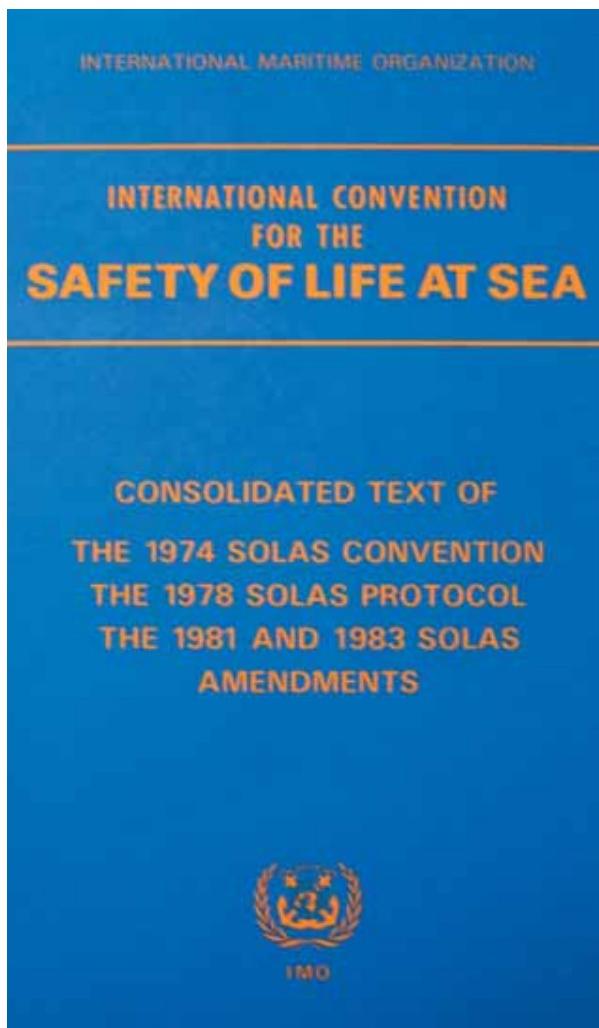
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amendment (2008/67/EC) had the effect of requiring firefighters to meet either EN 1486 and EN 469 and EN 531 (EN ISO 11612) or ISO 15583 on its own. This complication, which had not existed in previous iterations, was carried through into the 5th amendment (2009/26/EC), which became effective in April 2010 and remains in force, making it officially impossible to certify firefighter clothing to the MarED using EN 469 alone.

A new international standard has recently been developed and was published in June this year. The new standard, ISO 22488:2011 [Ships and marine technology – shipboard firefighters' outfits (protective clothing, gloves, boots and helmet)], has drawn substantially on the work undertaken for the recently issued European Standard.

Fortunately this difficulty will be resolved in the 6th amendment (2010/68/EU) when it comes into force in December 2011. This will allow certification by any of the three standards depending on the type of PPE involved. Progress towards this outcome has been helped by the recent certification by a German Notified Body of firefighter clothing using

EN 469 only, well in advance of the implementation of the 6th amendment. This has now been deemed as acceptable to the European Maritime Safety Agency (EMSA) responsible for the application of the directive, effectively allowing it to be used for PPE testing purposes across the EU ahead of the planned December implementation.

The most recently published EU Commission Directive 2010/68/EU amends the previous marine equipment CD 96/98/EC and in Section 3, on fire protection equipment, sets out the standards required for firefighters' outfits including close proximity PPE, boots, gloves and helmets. In summary, the requirements are:

Protective clothing for firefighting (A.1/3.3)	EN 469 (2005)
Reflective clothing for specialised firefighting (A.1/3.3)	EN 1486 (2007)
Protective clothing with a reflective outer surface (A.1/3.3)	ISO 15538 (2001)
Boots (A.1/3.4)	EN ISO 20344 (2004) and EN ISO 20345 (2004)
Gloves (A.1/3/5)	EN 659 (2003)
Helmet (A.1/3.6)	EN 443 (2008)

A new international standard has recently been developed and was published in June this year. The new standard, ISO 22488:2011 [Ships and marine technology – shipboard firefighters' outfits (protective clothing, gloves, boots and helmet)], has drawn substantially on the work undertaken for the recently issued European Standard. Organisations involved in the committee responsible for drafting this new standard, SME/32/-1 Lifesaving and fire protection, include the British Marine Federation, International Lifesaving Appliance Manufacturers Association (ILAMA), Society of Maritime Industries, Lloyds Register and the Maritime and Coastguard Agency. It is likely to be at least two years until this standard appears in a revised draft of the European Directive and cannot, therefore, yet be adopted by members of the EU.

Ivan Rich is Technical Manager at Bristol Uniforms

For further information, go to www.bristoluniforms.com

The jurisdiction of various marine safety regulatory bodies referred to in previous sections only extends to shipping. Fixed and floating structures at sea, such as oil and gas exploration structures and production platforms, are separately regulated by national health & safety bodies.



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Helmets Design – Standards and Culture Differences



Grant Bennett

Pacific Helmets

Personal Protective Equipment (PPE) is different from other equipment used in firefighting and rescue primarily because of the first P – Personal.

Of all equipment, PPE plays the most significant role in keeping personnel safe, therefore allowing them to effectively perform the often arduous tasks required of them. However the personnel who rely on the equipment often have little or no say in what equipment is issued. This responsibility usually falls upon a select group of experts who thoroughly assess equipment from many manufacturers and choose what they feel best suits their operational and budgetary requirements. This is not an easy task and it is a responsibility not to be taken lightly.

There are many factors to consider when making appropriate PPE selection. This article deals primarily with two:

- 1** Safety standards.
- 2** Cultural Influences.

The very minimum measurement of a product's ability to provide protection is the relevant certification that it carries to a particular standard. Standards vary greatly both by region and by application.

Work on keeping standards up to date with the requirements of the industry and the equipment available is an ongoing task. Helmet standards are no exception. More stringent operational requirements of helmets are largely a product of safety concerns in demanding operating environments. Despite the progress made in updating the various standards, some helmet manufacturers are already offering new designs that stretch the basic concepts of new standards. These commercial realities are likely to continue and it is imperative that the standards bodies are up to the task of ensuring



these innovations are reflected in the standards, and that they do not affect (if not bolster) safety in the field.

The 2008 version of EN443 resulted in requirements that far exceed those in the preceding 1997 standard. Changes include more stringent design requirements and testing of the face shield and eye protectors, neck protector, shell and retention system. The result is that the new standard offers far superior protection to the former version.

The marketplace drove the incorporation of design types and the design innovations offered by manufacturers to meet this demand.

rises from under, around and potentially inside the helmet. The standard requires the temperature at the tip of the burners to be 950°C, plus-or-minus 50°C.

Cultural and design influences were also present. The penchant of European firefighters for the so-called "jet-style" helmets created a requirement for manufacturers to meet design helmets that there in line with market requirements. Of course, safety is paramount, and an assessment must be made of any design changes and the manner in which they may affect the helmet operation and safety. These marketplace requirements resulted in

Work on keeping standards up to date with the requirements of the industry and the equipment available is an ongoing task. Helmet standards are no exception.

Perhaps the most significant change to EN 443 was the addition of a flame engulfment test similar to the test that can be applied under Annex E of EN 469:2005 to clothing certified to that standard. This is a major change that could well see a significant number of existing helmets off the market, or certainly requiring major sub-component upgrades. The test involves kitting a torso in full EN 469 jacket, SCBA mask, hood, and helmet complete with face shield, neck protector and Nomex chin strap. Because the flame and heat is directed both at the jacket as well as directly at the lower edges of the helmet for ten seconds, the flame and heat

the incorporation of design types into the EN 443 standard: Type A (traditional helmets) and Type B (helmets). Pacific Helmets has a long history of producing helmets in both styles.

The update of the Asia-Pacific region standard AS/NZS 4067 (Structural helmets only) is progressing thanks to the work of the SF.49 committee, with an updated version of the standards now only months away. The committee is clearly aware of the changes to other international standards and incorporated those that are appropriate for firefighters in the region. The requirements here are, of course, different. One example is that

higher ambient temperatures mean firefighters have, in the past, preferred to wear traditional (Type A) helmets, although this is now changing. Another is to do with the fact that fire appliance accidents are responsible for the largest proportion of firefighter deaths in Australia and New Zealand.

In America a new version of the NFPA 1971 helmet standard is due for publication next year. This too will see improvements to the minimum safety requirements of structural fire helmets. In the past NFPA 1971 document writers appeared to get themselves in a knot about the "jet-style" helmet shapes appearing in their market. Many parts of the standard created confusion when applied to the jet style shape of helmet. However changes to the next edition of the standard should clarify many of these contentious points.

Culturally, many crews in both Asia Pacific and the USA now seem to be willing to at least explore the option of a jet style structural helmet. That is not to say that one is superior to the other, but simply to point out that cultural perspectives do change. Both styles have their advantages and drawbacks. The main concern is that firefighters are happy to wear them and not tempted to take them off as soon as possible. Factors influencing this include weight and comfort.

Cultural issues affect the design of the helmet almost to the same extent as, if not more than, standards. All PPE must be culturally acceptable in order to ensure that personnel actually wear it.

Weight is an important consideration. Innovative manufacturers are well aware that for almost 90 percent of the time a helmet is worn, many front-line fire crews are wearing products that are too heavy, perhaps over-protective, impractical or inappropriate to the job at hand. By far the majority of tasks facing structural firefighters have little to do with structural building fires, yet the helmet they wear is designed assuming maximum risk and therefore has maximum weight and size. The vast majority of tasks they face involve RTAs, rural firefighting, line or water rescues, paramedic operations and even rescuing cats out of trees. Heavy, bulky, inconvenient helmets simply get removed when conducting many of these tasks and fire crews are looking for vastly better designs.

In the past this over-protection has been necessary because fire brigades have had to protect their crews and it has not been possible to separate various risk factors and wear helmets appropriate for the task. This may be fine in the US market where bigger and heavier always seems to be better, but excessive weight and size is an issue for Asia-Pacific firefighters just as it is in Europe.

Similar problems affect helmet manufacturers attempting to update designs of helmets for Asia-Pacific region fire brigades. The current standard sets lateral vision and other design restrictions that are not easily avoided by modern helmets with internally rotating face shields. As mentioned earlier, the new edition of EN 443 establishes two types of helmets (A & B) and these allow traditional style Type A helmets to cover less of the head than Type B helmets that must come down further

around the head and provide much greater shell cover. These designs should mean much improved thermal and impact protection for firefighters.

These developments typify the difficulties facing standards committees. Safety helmet development is proceeding so quickly that it is almost impossible for committees to keep up and manufacturers at the forefront of their game are driving designs forward very quickly. Traditional helmet designs like those typified by many old US and European designs may have held sway, but safety conscious brigades are looking for superior design options that offer their crews lighter-weight, more innovative helmet designs and, most importantly, greater safety.

Cultural issues affect the design of the helmet almost to the same extent as, if not more than, standards. All PPE must be culturally acceptable in order to ensure that personnel actually wear it. This means that the design and shape of a helmet must be what is expected of a fire helmet in any particular country. We have touched on the difference between traditional type helmets and the "jet-style" style helmets. The design differences between these two categories are vast.

Another cultural aspect that influences both the design of the helmets and indeed the drafting of

the standards is firefighting techniques themselves. Different cultures have developed contrasting approaches to the way fires are dealt with. This has resulted in different demands being placed on the PPE. Firefighters in some countries seem to run into a fire and look for a tap, whereas others have very much a stand back approach. The demands placed on the PPE are reflected in these approaches.

Standards – Requirements and Comparisons

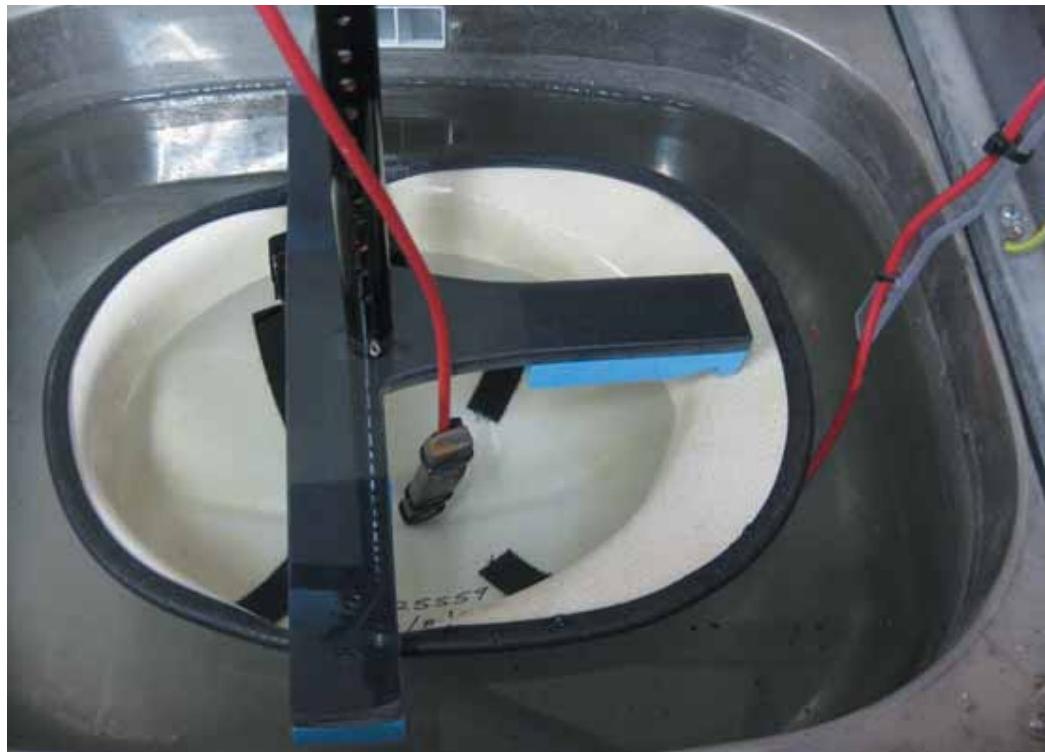
The AS/NZS 4067:2004 and NFPA 1971:2007 standards are largely similar. The most significant variations are between these two standards and EN 443:2008. For analysis purposes in this instance, AS/NZS 4067:2004 is used as a reference standard as this incorporates many requirements of the other two standards, and some not present in EN 443:2008 and NFPA 1971:2004.

Flammability Resistance Test:

This is a special test found only in AS 4067. The helmet shell is subjected to a 200°C radiant heat source for 60 seconds. This is followed immediately by subjecting the shell to a Bunsen burner flame for 15 seconds, while the radiant heat continues.

Convective Oven Heat Test:

In addition to the test above, an AS 4067 certified helmet has to be able to retain its shape and not melt or drip after being exposed to heat at 230°C for 3 minutes.



Durability Test:

This is a unique preconditioning test that is given to the helmet shell, prior to any shock impact tests. The helmet is dropped from a height of 1.5 metres onto a flat concrete surface twice, effectively "softening" the shell surfaces, especially the crown area, and therefore affects the shock impact reading in a negative way if the shell integrity is compromised.

Shock Impact Test:

Other standards only test helmets to the top 30 degrees from the centre crown. AS 4067 helmets are tested over a much wider area of the helmet, down to as far as 60 degrees from the centre line. This provides not just top impact but also side, front and rear impact in the event of other types

temperature of your helmet rose 25°C, because that is the temperature rise permitted in other standards. AS 4067 allows a maximum temperature increase of only 10°C and in our full liner, multi-layer helmets the temperature increase is less than 3°C.

Outside the Major Standards' Regions

The issue for some Asian fire brigades is that historical helmet protection levels have been so low as a consequence of the protection afforded by domestic manufacturers who have manufactured extremely low specification helmets. This is not true of all brigades, for the Hong Kong, Singapore, Taiwanese and some Korean fire brigades have been equipping their crews (both fire and paramedic) with EN 443 compliant helmets for

**Whether they chose European CE or AS/NZS standards,
the benefits will be similar and front-line crews will be
the beneficiaries.**

of potential injury, including falling from a ladder or through a building, or being involved in a vehicle accident; the leading cause of fatalities in Australia/New Zealand.

Electrical Insulation Test:

The tests conducted on AS 4067 certified helmets are far more severe than any other international standard. The voltage applied to the helmet, (be it conductive helmet test or wet shell test), is a deadly 2,200V and the duration is as long as one minute. Tests in other standards use only 1,200V for duration of just 15s.

Internal Temperature Rise Test:

If you think fighting a large structural fire is hot work imagine if while fighting this fire the inside

some years. This trend is becoming more common in both South Asia and the Indian sub-continent. The result will be a significant reduction in head trauma.

For many of these countries, the real issue in the first instance is one of raising the basic helmet and PPE performance standards. Whether they chose European CE or AS/NZS standards, the benefits will be similar and front-line crews will be the beneficiaries. For other fire brigades in Australia and New Zealand, the traditional shape of helmet is likely to change to half or full jet-styles as the standards document updates hopefully next year. With multi-function/multi-layer helmets now becoming available, stand-by for quite radical design shapes and features on firefighters' heads very soon.

Grant Bennett is Manager – Sales & Marketing at Pacific Helmets (NZ) Ltd.

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The Argus4 is one of the toughest cameras out there, withstanding extreme temperatures thanks to its rugged and durable casing. And with SceneSave image capture for up to 100 images, plus spot and ambient temperature detection, the Argus4 really can give you the courage you need to do your job.

See the **BIGGER** picture

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**Angus Drummond**

Argus Thermal Imaging

Testing Times

Taking decisions on which thermal imaging camera to buy can be a high-risk strategy if you rely on sales brochures and specification sheets to tell the whole story. There is only one sure-fire way to make the right decision and that is to hands-on test the shortlisted cameras against your own purchasing criteria.

While technical advances that improve firefighter safety and boost the survival prospects of casualties trapped in burning buildings or confined spaces following a natural or man-made disaster are to be wholeheartedly welcomed, thermal imaging has become one of those areas where it is quite possible to get carried away with the latest technology for its own sake.

Take for example, the move from 160 format sensors to 320 format sensors. Argus Thermal Imaging is often being asked if it will go to 640 format, in the mistaken belief that this alone will enhance the image resolution. The reality is that sensor technology has moved on, and the size of the sensor is no longer the sole influencing factor. In fact, we have recently re-introduced a 160 sensor that is a significant improvement over larger format sensors on the market. However, there are camera buyers who subscribe to the idea that bigger must be better – a view readily exploited by some manufacturers – without asking the question: "Is this what I need in a camera for my applications?"

Technical advances in thermal imaging must have a genuine applications benefit or they are doing little more, as in the case of merely increasing the resolution, than adding to the cost of the cameras and allowing the manufacturer to promote a more glossy specification. Another area to which careful thought needs to be given is the temperature in which the camera will operate. Having a camera capable of operating a

temperature that is not humanly survivable is valueless and, again, merely adds to the cost of the equipment. In such cases, all the promoting manufacturer or camera supplier is doing is attempting to make a virtue out of a valueless feature.

Establishing whether the technology is worthwhile and has real, measurable benefits can be achieved only by taking two steps that are vital if the most appropriate purchasing decision is to be made – there must be a clear understanding of the applications for which the camera will be used, and hands-on testing of shortlisted cameras is the only way of ensuring that the selected camera is the best one for the job.

Evolution of Thermal Imaging

While the relatively recent introduction of the personal thermal imager, whereby every firefighter has his or her own thermal imaging camera has become a popular talking point, arguably the most important developments in recent years have been first, the highly successful introduction of cameras that store still images for later analysis, followed by cameras that store video images. Both developments were pioneered by Argus and first reached the market in Argus thermal image cameras. The importance of these developments lies in their irreplaceable use in training firefighters and rescue specialists.

The latest development is the integration of telemetry that enables remote, wireless access to live images and video footage. This is a major step

THERMAL IMAGING



forward as it means that, for the first time, officers commanding a fire scene have visual simultaneous access to what is happening outside the building and inside the burning building or collapsed structure. In short, they are no longer "managing in the dark". Via satellite, these images can also be accessed anywhere in the world, which may be of immeasurable help in natural disasters where specialist help may come from a far-distant country.

This technology is being offered by a number of manufacturers, but the performance of individual systems varies widely, underpinning the imperative need to test equipment before making a final purchase decision. Technical difficulties and frequency-band interference mean that the effectiveness of this telemetry on some cameras on the market that use standard technology is limited to something like 100 metres. By comparison, Argus cameras have been tested successfully by London Fire Brigade in the London Underground and have

shown to be reliable three floors down. Similar tests have confirmed that they are equally reliable 15 floors up a multi-story building. This is due to Argus' use of technology developed for front-line military applications and the adoption of advanced COFDM (Coded Orthogonal Frequency Division Multiplexing) technology.

Fit for purpose

Any thermal imaging camera must be fit for its intended purpose. This might appear to be a statement of the obvious, but thermal imaging technology and its application are not as widely understood as might first appear. An example of the need for this care is where thermal imaging cameras will be used in ARFF (Aircraft Rescue and Fire fighting) operations, where the equipment may also be used to check the condition of aircraft tyres, brake pads, and be used for smoke detection. Increasingly, thermal imaging cameras are also being utilised by other members of the emergency services at the scene of an incident, taking their use beyond the usual realms for firefighting.

Part of the problem is that, in some ways, the adoption of thermal imaging within fire and rescue services around the world has gone down the same path as that trodden by SCBA (Self Contained Breathing Apparatus). While in many countries thermal imaging has now been fully embraced for firefighting and USAR (Urban Search and Rescue) operations, there are a number of countries still to embrace the technology – often due to financial constraints – just as there are countries that have yet to invest in SCBA equipment.

Hence, the level of awareness

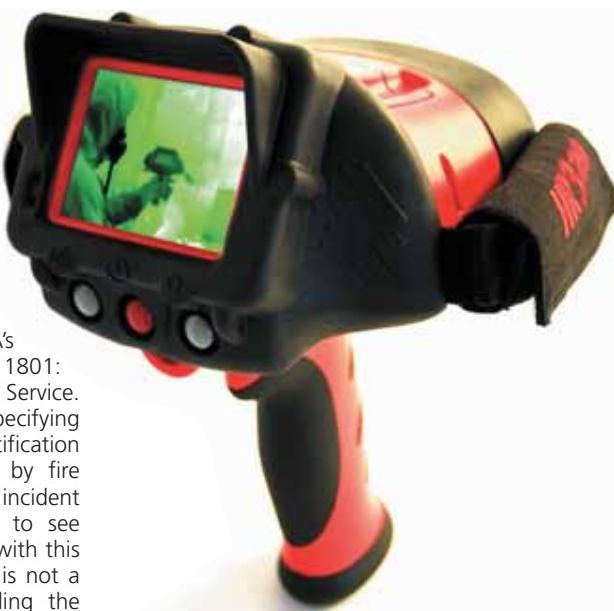


and understanding varies from country to country. When "catching up" this can lead to hasty decisions being made; manufacturers' sales literature can mistakenly be taken as telling the complete and accurate story, or equipment can be adopted solely on the basis of its being used by other fire and rescue services.

Setting the standard

Much has been written recently about standards and, in particular, the USA's National Fire Protection Association's NFPA 1801: Standard on Thermal Imagers for the Fire Service. This standard has the laudable aim of specifying the design, performance, testing, and certification requirements for thermal imagers used by fire service personnel during emergency incident operations. In fact, it is quite possible to see thermal cameras promoted as complying with this Standard. But this is not the case. There is not a camera currently on the market, including the Argus cameras, that complies because right now it is impossible to claim compliance as the NFPA is still endeavouring to establish a replicable test for image quality for what is widely acknowledged to be the most technical standard ever introduced by the NFPA.

So, while NFPA 1801 is to be welcomed and will surely ultimately be a major step forward, we are not there just yet. The current testing dates are unknown, and until individual thermal imaging cameras are tested, claiming compliance is nothing short of incorrect and misleading. A clear



Test, test and test

Clearly then, the only reliable way to reach a decision on which camera to select is by testing the equipment in the circumstances you anticipate encountering.

This, and only this, will enable essential features such as the camera's ruggedness, its image capture and image quality to be independently established in the real working environment. Only testing will show if the waterproof claims being made for the camera are accurate, and it is only by using a

Before selecting a thermal imaging camera there must be a clear understanding of the applications for which it will be used, and hands-on testing is the only way of ensuring that the selected camera is the best one for the job.

implication of this is that any claims made for any camera purporting to comply with NFPA 1801 must be suspect, again reinforcing the argument for hands-on testing.

Establishing the shortlist

When selecting thermal imaging camera companies for inclusion in a shortlist of potential suppliers there are a number of criteria that ought to be considered before a company is added.

For example, there is no real substitute for knowledge and experience and this is most likely to be found in a manufacturing company that specialises in thermal image technology, rather than one that sells a portfolio of fire and rescue equipment such as gas detection devices, breathing apparatus and personal protective clothing. The reality is that a company can be truly expert in only one field, and it is best if that area of special expertise is in thermal imaging. Selecting an established supplier is another consideration, because reliable technology is not easy to fast-track and newcomers tend to always be behind the established innovators in the market. Argus cameras are based on 30 years of innovation and feedback from the fire-fighting community.

thermal imaging camera in a real fire is it possible to see if it has the ability to see high and low temperatures at the same time, or if the heat intensity is more than the camera can handle and so takes over the entire screen. This is particularly important in rescue situations where the camera may be focused on an area that contains both high-heat flames and the body of a relatively low temperature casualty.

Testing even allows seemingly mundane features to be assessed, such as ease of use in stressful emergency environments, and whether the different language options – Argus cameras, for instance, now incorporate 18 languages – are easily accessible and readable.

Thermal imaging cameras play a major role in improving firefighter safety and users are constantly being asked to work in ever more dangerous environments as the recent earthquakes in New Zealand and Japan and the explosion and fire at the Fukushima Daiichi nuclear plant bear out. We owe it to them to provide the best possible equipment; to place in their hands cameras that have been tried and tested and not merely chosen from a brochure or specification sheet and that represent good value for money. It is a case where, certainly, one size does not fit all.

Angus Drummond is
Business Manager at Argus
Thermal Imaging

For further information, go to
www.argusdirect.com

When is Protective not Protective Clo



Being sure that personnel protection equipment performs as you would expect is vitally important, so make sure that the claims being made stand up to close scrutiny.

Alec Feldman

Fulcrum Consultants

In the field of purchasing, there is a well-known warning "Caveat Emptor" which translated from Latin means "let the buyer beware". In general terms, this aims to caution the buyer that no matter what the seller says about the product or service being purchased, the buyer has a responsibility to satisfy himself that what he is buying is what he believes he is buying. The principle Caveat Emptor is particularly relevant when considering buying products or services that are to protect people from potentially mortally dangerous exposures. In this field of activity, many sellers make claims about the products or services being offered that at best are not quite accurate and, at

worst, are false and can result in injury or death due to inadequate or unprotected exposure of the wearer or user of the product or service.

Clothing to protect people from the effects of heat and flame is a case in point. The purpose of using such protective clothing is to allow people to work in environments where, without the protection provided by the clothing, they could normally not work without the risk of injury or death. If the clothing that is purchased is below the specification stated and required, failure could seriously injure or kill the wearer.

A person who wants to buy an item for personal or household use generally knows in detail what

e clothing thing?

features and performance they require before they buy it. Usually he will specify his requirements to the salesperson and will have enough knowledge of the product he wishes to buy to be able to evaluate whether the claims made by the seller are valid or not. On the other hand, when items are purchased that could save one's life, it is my experience that the potential purchaser has little knowledge of the features required and usually what the seller claims about the product is accepted without question. Perhaps this is because in this area of activity, the purchaser does not know the questions to ask? Purchasers should be aware that there are International minimum specifications for the purchase of all items of Personal Protective Equipment (PPE).

Where there is a risk that personnel may be exposed to heat and/or flame in their work place, they should be issued with suitable protective clothing. So they make the correct choice of such clothing, purchasers should know what the clothing is expected to do. The role of such clothing is initially to act as a flame shield when exposed to sudden flame, that is, a barrier between the wearer and the flames, and to provide protection against heat transfer from the

Reputable organisations that produce quality products that perform as it is claimed they perform, rigidly impose standards of performance and of quality from the beginning of the value chain until its end, when the user takes delivery of the final product.

flame/heat source. It should also provide protection for the wearer as they escape from the exposure. This type of protective clothing should provide the required level of thermal protection consistent with the potential risk to which the wearer might be exposed and escaping from and for its lifetime, should not burn, melt or disintegrate on exposure to flame. It should also provide mechanical protection for resistance against tearing, abrasion, seam splitting and, subject to its intended use, it may also need to provide protection against the weather and protection against chemicals.

In such an area of activity, where failure of protection is essential and is not an option, it is critical that the product is purchased from sources where there are continuous checks and testing of the product to provide the manufacturer, purchaser and user with a level of certainty that the protective clothing being purchased is what is known as "fit for purpose", namely that it will do what is expected of it within the environment in which it is expected to perform.

The final production of items of protective clothing is a result of passing through a "value chain"; a chain of activities whereby products pass through a line of stages of manufacture and at each activity the original raw material

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is subjected to manufacturing processes that assist on its way to becoming the finished product. Reputable organisations that produce quality products that perform as it is claimed they perform, rigidly impose standards of performance and of quality from the beginning of the value chain until its end, when the user takes delivery of the final product.

The value chain for clothing to protect against heat and flame commences as a fibre; this is manufactured into yarns, the yarn is then manufactured into fabric and the fabric is manufactured into the clothing.

Fibre

Fibre forms the basic element of fabrics and other textile structures. A type of fibre that is widely used in clothing to protect against heat and flame is in a chemical family called meta-aramid, a fibre that is characterised by its strength and in particular, its excellent resistance to heat and flame throughout its lifetime. Well known meta-aramid fibres used in clothing to protect against heat and flame are Kermel, Nomex and Conex.

Yarn

Fibres in their raw form cannot be used to make clothing. For this purpose, they must be converted into yarns and the process used for yarn formation is spinning, the twisting together of fibres to form yarn. Yarns are used to construct the fabric and are also used to manufacture threads to sew the fabric together as a garment. A meta-aramid yarn results from spinning meta-aramid fibre.

Fabric

The conversion of yarns into fabric is a major change in physical form. In manufacturing fabrics for clothing to protect against heat and flame using inherently flame resistant fibres, other factors are taken into account subject to the ultimate end use of the garment. These factors include structure, weight, comfort, strength, resilience and colour etc. Other factors may also need to be considered subject to the proposed ultimate end use, such as water/chemical resistance, visibility and protection against electrostatic discharge. Fabrics manufactured from meta-aramid yarns will be mixed with other special high-quality fibres to provide these required features in the fabric that in the next stage of the value chain will be used to manufacture the garment.

Garment

The garment manufacturer designs into the garment the features that it is expected the ultimate purchaser will require, such as type and location of pockets and closure systems. With clothing to protect against heat and flame, the designer must ensure that the design of garment will provide protection to the upper and lower torso including the arms to the wrists and the legs to the feet in the event of unexpected flame engulfment of the wearer. The thread that is used to sew the critical parts of the garment should be made from meta-aramid or other inherently flame resisting yarn. If, for example, the thread used at the main seams of the garment is not of such quality, when exposed to flame it will melt or burn and the garment will fall apart, thus exposing the wearer to possible direct contact with the flames/heat source.

The garment manufacturer designs into the garment the features that it is expected the ultimate purchaser will require, such as type and location of pockets and closure systems.

At all stages of the value chain, reputable manufacturers will continually carry out sampling and testing to verify that protection and quality of the product are maintained. At the stage of garment manufacture, the garments will be tested and certified by an independent testing laboratory to either CEN (European), NFPA (American) or ISO (International) standards for the type of protective clothing for which the end use is intended. Such tests are destructive tests of fabric and/or garment and so it is very important that the garment manufacturer can adequately demonstrate that garments of the same design, content and quality of the garments/fabrics that successfully passed the relevant CEN/NFPA/ISO tests are being made by the manufacturer on a consistent basis.

Many reputable manufacturers throughout the value chain demonstrate their commitment to quality by having in place the internationally recognised ISO 9001 standard for quality management.

ment systems. To retain certification to ISO 9001, organisations must be regularly audited by nationally recognised certification bodies, which themselves require to be accredited by National and/or International accreditation bodies in order to undertake this work.

Sale to User

In a quality value chain, there will be no passing on from one stage to the next until the manufacturer that is to receive the product is quite satisfied that what they are to receive and to take to the next stage of the chain is of a level of quality that is acceptable by all concerned. Each organisation engaged in each stage of the value chain should be able to produce third-party verification of quality in production and other activity. This means that when the final stage of the value chain is reached and the purchasing decision can be taken, the potential purchaser can establish the quality of product from the beginning of the manufacturing process along the value chain to the finished product.

The person who makes the purchasing decision for protective clothing is the person who sets the organisation's parameters for protection of the people who have to wear it.

After purchase, the user should have in operation procedures for the use, inspection, care and maintenance of the protective clothing. Unless the protective clothing purchased is of internationally recognised quality and certified to the minimum performance levels required by CEN/NFPA/ISO when it begins its life, all efforts to control the protective ability of the clothing in use will come to nothing.

Throughout the world there are Health and Safety requirements to protect company employees. There is also a responsibility placed on employers to ensure the safety of their employees. This is often disregarded when purchasing departments, with no knowledge of the dangers inherent at an incident/accident over-rule the end user department on matters of cost.

The person who makes the purchasing decision for protective clothing is the person who sets the organisation's parameters for protection of the people who have to wear it. Therefore the decision maker should have knowledge of the risks against which the protective clothing is supposed to protect and before selecting the protective clothing, a risk assessment of the workplace should be carried out to establish the type of protective clothing that will be "fit for purpose" for their employees who will wear it.

If purchasers have any concerns about the validity of any certification presented by a potential vendor, including claims of certification to ISO 9001, they should check the validity of the certification by contacting the issuer of the

certification to establish whether or not the certification documentation is genuine and within valid dates and that it has not been altered in any way, such as by removal of the manufacturer's identity at any point in the value chain. Reputable certification bodies are very happy to answer such questions and indeed encourage any potential purchaser or user to take this action.

Purchasers should realise that they are the main players in any purchasing decision – it is ultimately the decision of the purchaser whether or not the purchase takes place. As such, the purchaser should make the necessary demands from the supplier for the supplier to demonstrate that what they are buying is what they think they are buying. Any reputable manufacturer/supplier will easily and readily comply with this requirement.

So I say to Purchasers, "Caveat Emptor" – and truly protect the lives of those who will wear the clothing that you purchase for them.

IFF

Alec Feldman is Principal of Fulcrum Consultants and author of the JOIFF Handbook on PPE to protect against heat and flame

For further information, go to www.fulcrum-consultants.com

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Wayne L. Eder

University of Nevada,
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Academy



The University of Nevada, Reno Fire Science Academy (FSA) provides hands-on training, for real world emergencies, using real fuels and live fire.

2012 will mark the 40th anniversary of the FSA. Originally located in Stead, Nevada USA the FSA was moved to Carlin, Nevada in 1999. It is home to one of the most comprehensive training facilities in the world, offering multi-media classrooms and a diverse drill field. A staff of 30 full time and approximately 40 part-time instructors and field safety personnel operate the facility year-round providing a variety of fire and emergency service training programs.

The primary mission of the FSA is to train firefighters and emergency responders from private-sector industries including petrochemical, mining, aviation, technology, transportation and power, as well as municipal, county, state, federal and international agencies and governments. Full scale props containing actual components from oil refineries are the centrepiece of the training field. Here, students apply techniques learned in the classroom through hands-on evolutions utilising the latest safety and firefighting equipment.

Separate training areas are utilised for hazardous materials, confined space, technical rescue, Urban Search and Rescue (USAR), and aircraft rescue and fire fighting (ARFF). The FSA hosts open enrolment courses, available to any student that meets the prerequisites for a course, as well as "company special" courses, where companies may hold a specific class for their personnel using

the FSA facilities. Many large clients take advantage of this program each year, which allows them to address site-specific and corporate-specific issues in training exercises.

Pro Board Accreditation

In 2010, the FSA moved forward with a long-planned program to obtain accreditation through Pro Board. The FSA is currently completing the final phases of the initial accreditation for NFPA 1081 Incipient and Exterior Fire Brigade Member with future plans for additional course accreditation. Why is Pro Board accreditation so important? Any professional organisation in today's litigious society should work diligently toward accreditation process, and the FSA is no exception. By providing accredited training, clients are assured that the training their personnel receive meets industry consensus standards and has been reviewed by a non-biased third party.

The FSA's Pro Board accreditation involves the standard Pro Board review procedure. FSA staff submitted a complete, written application package requesting accreditation, specifically for the NFPA 1081 Standard for Industrial Fire Brigade Member Professional Qualifications, which was reviewed by Pro Board staff. After this initial review, clarifications and additional information were requested in preparation for a two-day site visit

Sets the Standard



by Pro Board staff members.

During this site visit, classroom and field training facilities were reviewed, and FSA staff members were evaluated, along with a careful review of curriculum and policies and procedures. Following the site visit, recommendations were made for changes to the FSA operations which have been complete. A final review and ultimate approval is now in the hands of the Pro Board governing board which will meet to determine the FSA's ability to deliver Pro Board accredited courses. Additional information on Pro Board can be found at <http://www.theproboard.org/>.

Additional accreditation of training programs is available through the International Fire Service Accreditation Congress (IFSAC) at www.ifsac.org/. When selecting a training facility, choose one that is accredited to provide your staff with the highest level of training.

Training at the FSA

For those interested in training at the FSA, the FSA website is at www.fireacademy.unr.edu. This site provides you with a virtual visit to the facility and allows you to review course descriptions, photographs of training, introductions to staff members, and the all important registration forms to allow you to register for a class.

Regardless of whether you need entry level training, or desire to reserve the facility to host a company special class for intermediate or advanced training of your staff, use the website to

plan your training needs. The FSA provides everything you need for training, including SCBA, hose, nozzles, extinguishers and other equipment. There is even an option to rent structural turnouts (PPE) for a nominal charge in lieu of shipping, cleaning and maintaining your own equipment.

Upon arrival, students are directed to locker rooms where equipment can be stored during the training session. These locker rooms are provided with showers and other facilities for the comfort of students. Classrooms are provided with multi-media instructional aides, and students are able to learn in comfortable classroom settings prior to applying their knowledge on the field.

Real World Fuel for Real World Training

The FSA utilises hydrocarbon-based fuels to provide "hands on" training for students. A special mixture of diesel and hexane is designed to provide intense flames and volumes of smoke while reducing the impact on the environment. This training is designed around the FSA's mission:

The University of Nevada, Reno Fire Science Academy is a leader in the advancement and dissemination of knowledge to our global clientele.

The University of Nevada, Fire Science Academy is built upon a culture of respect for safety, client service, teamwork, and community support. We uphold the highest levels of ethical and professional standards. We foster an environment that challenges us to seek continuous improvement in every aspect of our operation.

FIREFIGHTER TRAINING



Our clients are experts in their chosen fields and demand we be experts in ours. To accomplish this, we provide flexible and responsive services of the highest quality, every day.

Dedication to these values sets us apart.
FSA instructors are augmented by a safety team

of skilled individuals that work to keep students and staff safe during training exercises. This team is backed up by a support staff of administrative and maintenance professionals that work to keep the student's visit to FSA both safe and enjoyable. One of the more popular services is the coordina-

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tion by FSA staff to receive and return protective clothing and other equipment used by individual students or corporate clients.

In any case, whether an individual student, or a corporate class of 100 or more, students are provided with safe, effective, affordable, hands on training that meets industry standards and improves effectiveness of fire brigades or emergency response organisations upon their return to duty.

Additional Training

While industrial fire fighting training is a major focus of the FSA, the Academy also provides additional training for emergency response organisations. These include:

- **Command and Control:** Training for emergency response leadership is critical to the successful conclusion of a major industrial incident. Fire brigade officers can attend the popular Incident Command Emergency Response (ICER) or Incident Safety Officer (ISO) courses to hone their command skills and learn valuable techniques for managing incidents.
- **Confined Space and Technical Rescue:** Northern Nevada is a centre for mining of precious metals in the United States. Mine rescue teams from throughout the western United States train at the FSA for mine emergencies. Industrial and municipal clients can utilise these same training props to prepare for industrial rescues in their communities.
- **Hazardous Materials:** Actual shipping vessels, containers, and vehicles are utilised to augment classroom training of hazardous materials students. Hands-on training includes simulated releases based on real world events with actual equipment used to control releases.
- **Aircraft Rescue and Fire Fighting (ARFF):** FSA's ARFF training meets Federal Aviation Administration (FAA) and other regulatory requirements for both initial and annual certification for airport firefighters.

In addition to those courses listed on the website, the FSA can design tailor made training for your organisation, taking into consideration areas specific regulations and requirements.

Worldwide Reach

FSA Worldwide is the outreach unit of the FSA providing programs and services to clients at locations around the world.

Nearly every open enrolment program available at the training Academy in USA can be delivered to students at a location closer to home, anywhere in the world. FSA Worldwide also works with clients to create customised training to meet their specific needs. FSA staff and instructors travel to facilities globally, providing the technical expertise to deliver state of the art training of fire and emergency response subjects. FSA Worldwide has also partnered with other training facilities to provide localised training in industrial centres. **IFF**

Wayne L. Eder is the Director of the University of Nevada, Reno Fire Science Academy

For further information, go to www.fireacademy.unr.edu

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Graham Collins



Self Contained Breathing Apparatus is now widely regarded as invaluable standard equipment in many fire and rescue services around the world, but without a readily available and reliable supply of compressed air, its use is strictly quickly curtailed.

Self Contained Breathing Apparatus (SCBA) is now well established as an essential piece of life-preserving equipment for fire and rescue services' personnel in many – although by no means all – countries. Originally most widely used by firefighters when entering burning buildings, its use has spread with the growing number of natural and man-made disasters and the risks associated with the manufacture, storage and distribution of a whole raft of hazardous materials upon which today's industries seem to increasing depend. Today Self Contained Breathing Apparatus is used widely during nuclear accidents such as the Fukushima nuclear power plant disaster on Japan's northern Pacific coast, and during confined space and structural collapse rescue operations, of which the recent earthquake in Christchurch, New Zealand is just one example.

Equipment Choice

The available options include utilising a third-party commercial operation to refill air cylinders, or investing in large storage cylinders and then use this stored air to do your own recharging. However, if as is commonly the case with fire and rescue SCBA cylinders, namely that air cylinders are

emptied regularly for training or maintenance, or as a result of firefighting or rescue operations, there is a strong case to be made in favour of purchasing a compressor and recharging cylinders in-house.

Certainly, there are any number of reliable manufacturers and durable models on the market that meet the demanding requirements of the fire and rescue services and satisfy the need for ease of use, ease of maintenance and low running cost. These compressors comply with the prevailing standards, such as BS EN 12021:1999 (Respiratory protective devices. Compressed air for breathing apparatus) and NFPA 1989: (Standard on breathing air quality for emergency services respiratory protection).

In brief, it comes down to three options when it comes to in-house recharging equipment for SCBA cylinders. These are: a stand-alone compressor; a fully integrated Self Contained Breathing Apparatus recharging system; or a complete SCBA trailer system.

Which is the most appropriate and cost-effective option will differ from one fire and rescue service to another and will depend on a number of key factors. These considerations include the number of SCBA cylinders that will need to be refilled at

any particular location. Another consideration that has been highlighted by the recent spate of natural disasters and the resulting confined space rescues and CBRN (Chemical, Biological, Radiological, and Nuclear) operations is the possibility of requiring cylinders at a remote or access-challenging location that may call for a highly mobile compressor solution and fast recharging of discharged cylinders. This is most often achieved through the use of portable compressors.

Currently there is a wide selection of horizontal, vertical, portable and mobile models from which to choose with, typically, charging capacities that span from around 170 litres-a-minute to in excess of 570 litres-a-minute. Some of these compressors can be heavy and cumbersome and may not fit easily through normal doorway openings, which will complicate and add cost to the installation and all but prohibit the compressor's easy relocation.

Quiet operation can, in some locations, be important particularly if the compressor is located close to personnel's sleeping quarters. Another siting consideration is the need to ensure that the air intake is positioned carefully to be free of excess pollution. It should not, for example, face into a vehicle parking area or loading bay, and it is

recommended by the manufacturer, as substitute oils may not be able to take moisture from the air; they may burn in the compressor creating carbon monoxide, and can quickly overwhelm the air purification system. The oil and the purification systems must be changed periodically, as failing to change either or both can also lead to contaminated air.

Air purification filters currently available on the market incorporate a number of what are sometimes referred to as "pollution grabbers". These include devices that dry the air as it enters the filter because, without dry air, the air in the apparatus may easily become toxic. A good rule of thumb is never breathe air that has an odour or "taste". Additionally, the presence of wet air can accelerate the corrosion of the metallic tank.

Essential Training

A breathing air cylinder should be filled to 90 percent of its rated pressure; a cylinder that has not must be isolated from fully charged cylinders until it has been recharged. The compression of a gas naturally increases its temperature – this is often referred to as the heat of compression – so to reduce the amount of heating that can occur during cylinder refilling, cylinders should be filled

Perhaps the single most important consideration when selecting a compressor is the need to be certain that the air leaving the compressor is suitable for human consumption, as clean breathing air is essential to sustaining life and maintaining good health.

worth considering incorporating automatic controls to monitor filtration conditions. When it comes to portable compressor units, the power options include electric, petrol and diesel. These compressors share many of the features of the stationary equipment but obviously require a mobile transport unit.

Selection Criteria

Perhaps the single most important consideration when selecting a compressor is the need to be certain that the air leaving the compressor is suitable for human consumption, as clean breathing air is essential to sustaining life and maintaining good health. This is particularly so when using high-pressure Self Contained Breathing Apparatus in emergency situations. The air must have an oxygen content of between 19.5 percent and 23.5 percent; the level of carbon monoxide (CO) must be less than ten parts per million (ppm); and the limit for carbon dioxide (CO₂) must be less than 500 parts per million. Oil and oil products must be less than 5 milligrams per cubic meter, and the amount of water vapour must be less than 67 ppm.

From the compressor operator's standpoint, this means ensuring that the equipment is regularly serviced, is properly maintained, and is used in strict accordance with the compressor manufacturer's guidelines and operating instructions. For example, it is important to use the type of oil

at a rate of between 300 psi/minute and 600 psi/minute.

When it comes to refilling Self Contained Breathing Apparatus cylinders there are three over-riding ground rules.

The first is that current refilling safety precautions and compressor operating instructions should be posted at every fill station. Second, SCBA cylinders should be filled only by fully trained personnel using proper breathing equipment. Finally, although it may appear unnecessary to say it, cylinders should be filled only with approved breathing air. Additionally, there are two essential safety precautions that specially trained – and the emphasis here is on "specially trained" – personnel must take. It is important to ensure that the cylinder is fully charged but not over-pressurised, and it is equally essential to make sure that the cylinders are placed in a shielded charging station to prevent possibly serious injury in the event of a hose or cylinder rupture.

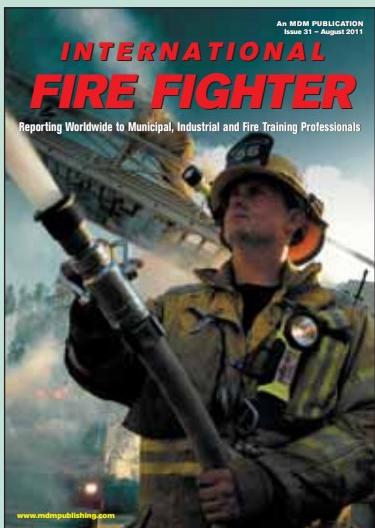
Trained personnel must be able to confirm that a compressor is working correctly and safely during operation. They must also know how to clean and maintain the compressor to avoid relief valve failure or even an explosion. Fortunately, when installing and commissioning a new compressor, the majority of reputable compressor manufacturers provide on-site training for all personnel that will be operating and maintaining the equipment.

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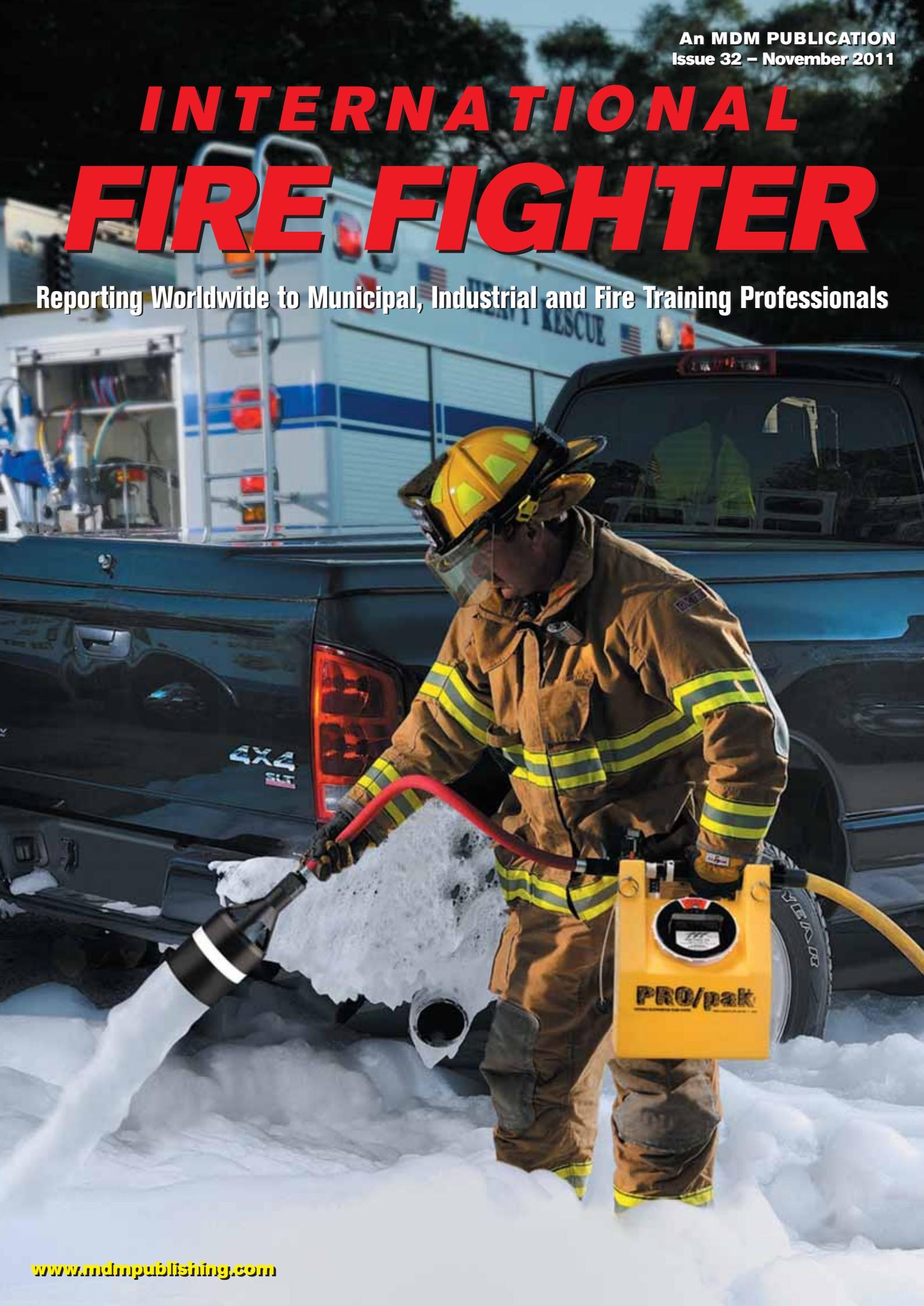
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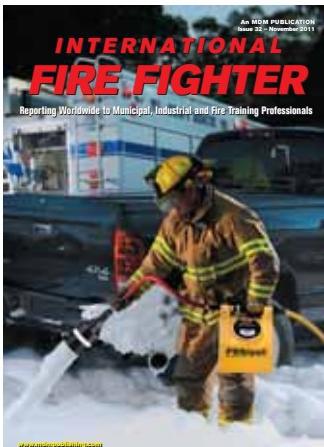
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**Graham Collins**

Who Counts?

It was Samuel Langhorne Clemens, better known to the world as Mark Twain, who popularised the phrase 'lies, damned lies, and statistics' to describe the persuasive power of numbers, and particularly the use of statistics to bolster weak arguments. Indeed, thanks to the power of mass communication, we have all but become immune, even anaesthetised to the true impact of statistics when they are cited in news broadcasts. But behind each set of figures there is a human story, perhaps nowhere more so than when the numbers relate to death or injury, be it actual or potential.

Perhaps it is the technology of our daily work, the sophistication of the equipment we use, or the cleverness of the techniques we adopt that has the potential tendency to dull our senses to the human dimension of natural or man-made disasters, and the decisions that are made that impact on the health and safety of people around the world.

Behind every set of statistics there is a human story, perhaps nowhere more so than when the numbers relate death or injury, be it actual or potential.

I read two statistics recently that brought this into sharp focus.

The first was that an estimated one billion people live in shanty towns or slums in the developing world where fire safety is non-existent; worse, where living conditions actually enhance the prospect of a small fire intensifying into a major conflagration, and where safe evacuation is a matter of pure chance. According to the estimates I read, it is expected that this number will swell to 1.4 billion by the end of the current decade, and it is projected that in the next fifty years, two-thirds of humanity will be living in towns and cities. Significantly a large part of this growth will take place in the form of informal settlements – densely populated, self-constructed squatter settlements, shanty towns or slums that are characterised by make-shift shelters that are built from whatever material happens to be available.

The fuel load in these environments is invariably massive, and in many countries where these shanty towns are prevalent, the resources of the fire and rescue services are simply inadequate to cope with the challenge.

The second set of figures to come my way was from the US Department of Homeland Security's US Fire Administration. It catalogued the 74 firefighter fatalities that have occurred so far this year, bringing home once again the hazardous nature of the profession. With a couple of months still to go before the end of the year, this tally already exceeds the 2010 figure of 72 deaths.

On the positive side, both years' firefighter fatality statistics – unless there is a horrific level of loss of life in the next few weeks – will mean that six times in the past decade firefighter deaths in the USA will have fallen below 100 for the year. Interestingly, this improvement is said to be down largely thanks to advances in training and

equipment and improved fire codes. But that must be of limited comfort to the families and friends of those who lost their life in the line of duty. They died from overexertion, stress and heart attacks, from the impact of collapsed buildings, vehicle crashes, or trapped in a blaze. Everyone was a husband, a father, a son or a brother, and everyone needs to be remembered not as a statistic, but as a dedicated and honourable human being.

I believe the message behind these two sets of figures is clear. Those around the world with the power and responsibility to make decisions regarding poverty eradication, urbanisation, building codes, construction standards, health and safety and emergency services funding must always remember that statistics and balance sheets are not the issue; it is the lives of those caught up in a disaster and the lives of those who, at a moment's notice, put their own safety aside to save others.

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Skedco - 30 Years of Service

In early 1981, Bud Calkin, a former US Army medic who had struggled with the Army's litters during his time in the military, re-designed a game carrier invented by his sister for dragging deer out of the woods into what is now known as the Sked Stretcher.

Skedco was then incorporated in December of 1981 by Bud and Catherine Calkin. Calkin believed this was a giant leap forward in patient transport from the battlefield but, because it was so different than the standard litters, few people would even look at it. After ten years of diligent work and many small quantity sales the Sked was purchased in massive quantities for Operation Desert Storm. The giant leap was then seen for what it was.

The Military then understood its value on the battlefield. It surpassed all of the claims made by Skedco. Skedco has since grown substantially while developing many other new and different products for military and civilian EMS and rescue. There are now several versions of the Sked Stretcher along with CASEVAC systems individual

Sked-Evac tripod, the Skedco Rescue Hauler and Microhauler that are pre-rigged 4:1 mechanical advantage rope haul systems, and the Half Sked, a bailout kit that features Skedco's window anchor for far greater safety than those with hooks, as they fit in the bottom corner of a window giving two points of contact with the window for the greater safety.

Skedco has confined space rescue kits for one stop shopping to save time and money. Patients immobilised in the Oregon Spine Splint and placed into a Sked stretcher can pass through smaller holes than when in any other stretcher.

Skedco has a bleeding simulator that will simulate arterial, venous and capillary bleeds simultaneously. It is remote controlled and when worn by live simulated casualties is the most effective haemorrhage control trainer in the world. It allows you to present a screaming, combative, profusely-bleeding patient that will add realism to any training scenario. It even features a bullet impact simulator, a sucking chest wound and a



first aid kits, self-rescue kits, laryngoscope kits, "extreme medicine" knives, packs and bags for a wide range of medical and rescue applications, including many items for use in helicopters.

Understanding the need, Calkin developed the Hazmat, decontaminable Sked for the rescue of victims in a contaminated area and for mass casualty evacuation from buildings, subways and other areas of possible mass casualty or hazmat rescue. With the Skedco/Skyhook system 300 to 400 people can be evacuated from the "hot zone" in as little as 20 minutes. It will drag up to six loaded HMD Skeds at a time while taking the empty HMD Skeds back to the "hot zone". No other system can do that.

Skedco has also developed other confined space rescue equipment. These include the

needle decompression simulator that rivals the real thing. It creates stress and chaos to enhance any training incident. If the medic does not treat the wounds or injuries properly, the bleeding continues until it is done right or the system bleeds out at, which time the medic fails and must be required to do it over until he or she gets it right. This allows for more patients saved from the most preventable cause of death on the battlefield or street in real life situations.

Skedco Inc. is located in its own building in Tualatin Oregon, USA where all of their products are manufactured under strict quality control. Only a very few items are made outside the USA. That quality control gives Skedco a much higher quality product line. Skedco's 30th anniversary of service will be December of this year.

For more information, go to
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New York's New Hero

The Fire Department of New York (FDNY) has taken delivery of the award winning HEROPipe high-rise firefighting equipment that ELKHART BRASS introduced at this year's Fire Department Instructor's Conference (FDIC).

Developed by front-line Chicago Fire Lieutenant, Michael Wielgat, HEROPipe is a lightweight water delivery system that allows firefighters to deliver a master stream to any floor of a

high-rise structure from the vantage point of the floor below. Described by Elkhart Brass as: "... a real game-changer for high-rise fires." HEROPipe is heralded as being the first viable solution for fires that cannot be reached either from a ladder truck or an adjacent building. By enabling firefighters to neutralise incidents from the floor below, the solution poses far less risk to the team than a direct attack.

The system can be set up for action in as little as three minutes with a two-person team. Once the proper attack points have been determined, the aluminium manifold is secured to the exterior of the floor below the incident. The telescopic waterway is made of anodized aluminium and is capable of

delivering large volumes of water. Combined with Elkhart's Sidewinder EXM monitor, a targeted stream can be directed by remote control.

For more information, go to www.elkhartbrass.com

The Eagle Has Landed

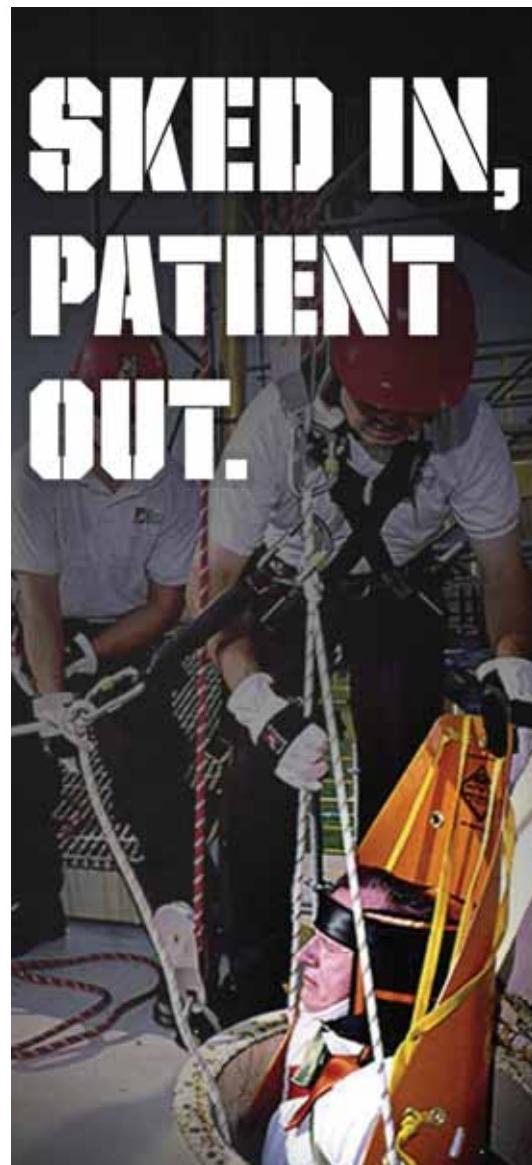
The new Eagle Attack thermal imaging camera from SCOTT SAFETY has been launched with the promise of delivering all the performance, quality and durability that firefighters demand, offering a full-featured imager in a compact form with no sacrifice on quality. Its high resolution design is claimed to provide users with great image quality and functionality not normally available in lightweight imagers. Developed for on-the-job reliability, durability and ease-of-use, the Eagle Attack imager is being promoted as being one of the lightest and most portable imagers in the industry.

Smaller-sized cameras typically sacrifice features and image quality for portability and while larger imagers, although feature-rich, can be bulky and more difficult to handle in tight situations. The Eagle Attack aims to be the ideal combination of the best of both small and large imagers.

It features a generous display, a high degree dynamic range and class-leading resolution and sensitivity, making fire analysis quick and easy. The lens is protected by silicone bumpers and if anything ever happens to the germanium lens, it has been engineered so that change-out can be done in the field.

The camera can be custom-configured to suit changing needs. It is offered with either a greyscale or colour imagery and the optional Scott thermal video recorder, which automatically captures every event for training and documentation purposes. It also comes in three rubber bumper colours to suit the customer's own branding.

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US Department's Quantum Leap

The Mesa Fire Department in Mesa, Arizona, USA has ordered three PIERCE Quantum pumper vehicles and one Quantum aerial platform, boosting the Fire Department's front line apparatus fleet to include 33 Quantum pumbers and five Quantum aerials.

Each of the Quantum pumbers is equipped with a 500 hp EPA 2010 certified engine, TAK-4 independent front suspension, 480mm front bumper extension, seating for six firefighters, frontal impact and side roll protection systems, Husky 12 foam system, Hercules CAF system, 5700 litres-a-minute single stage bronze pump, 3800 litres-a-minute monitor with electric remote control, hydraulic ladder rack and Command Zone advanced electronics.

The Quantum 60-metre aerial platform features a 7600 litre-a-minute single stage bronze pump, twin electric monitors, 950-litre water tank, Husky 12 foam system, 430-amp



alternator, a 4.9-metre stabiliser spread with 300mm of ground penetration, TAK-4 independent front suspension and air ride rear suspension, slide out adjustable trays, swing-out tool board, storage for seven air bottles in fenders, telescoping tripod lights, breathing air to the tip, and LED lighting along the aerial device.

The city of Mesa is the 40th largest city in the United States, and the Mesa Fire Department safeguards a population of 468,012. In 2010, the department handled more than 55,000 runs out of 18 fire

stations. It operates a standard replacement schedule that calls for new vehicles every eight to ten years, or every 210,000 kilometres. The department then rotates the units into reserve status for three to five years, or 240,000 kilometres.

For more information, go to www.piercemfg.com

Keeping it Quiet



The use of low noise rescue tools is being given a boost following remarks by Marc Bigalke, medical director of rescue services for the city of Amberg in Germany and an emergency physician. He confirms that noise is one of the unwanted side effects of rescue operations. Loud power units make communication more difficult, not only with the patient but also between the rescuer personnel.

LUKAS has joined the debate, stressing the importance of calming the patient to help reduce stress and minimise the psychological impact. All rescue activities, the company asserts, should always be performed with the least possible impact on the patient, and the use of low-noise rescue tools helps reduce these undesirable disturbances to the lowest possible level.

With its eDRAULIC series, Lukas offers what it believes are the quietest rescue tools, and the safest ones for patients. The tools operate with electricity and generate sound emissions only when they are in use. If the eDRAULIC tool is not in use, it is completely silent.

For more information, go to www.lukas.com

First platform for Uzbekistan



CTE has delivered Uzbekistan's first aerial ladder platform – a 45-metre high, 450 kg basket payload B-FIRE 450 platform in collaboration with its firefighting vehicle manufacturing partner, Tital. The vehicle is being used by the municipal fire brigade in the capital, Tashkent.

The telescopic-jib B-FIRE range of platforms is available up to 55 metres high, with a maximum capacity of 450 kg, which allows access to four workers with full equipment. A front flap, designed as a walkway, and an entrance in the basket on the front wall allows for a smooth and continuous connection from the at-height rescue level to ground level, while electronic ultrasonic technology prevents accidental collision of the basket. The machine also includes a side staircase made of aluminium alloy, an integrated electronic system, three command posts, automatic stabilization and interior lighting.

For more information, go to www.ctelift.com

Cutters Edge Introduces

"Next Generation Technology" MULTI-CUT Fire Rescue Saws

Cutters Edge has been manufacturing fire rescue saws since 1984. Unlike competitors, our saws are not designed for construction, demolition or logging with fire rescue labels added – our saws are engineered and built exclusively for the fire and rescue market.

Our "Next Generation Technology" 2100 Series MULTI-CUT Fire Rescue Saws use the latest advancements in 2-stroke engine technology to generate more power, more torque and more fuel efficiency. Cutters Edge "Next Generation Technology" engines utilize dual intakes that split the airflow into one fresh-air stream and one clean-air stream for the fuel-air mixture. The fresh air intake forms a barrier that delays the fresh-fuel mix from entering the engine while assisting in exhausting the burned gases. Then the fuel-air mixture flushes into the engine, resulting in more power and less emissions, compared to conventional 2-stroke engines.

In addition to new engine technology, Cutters Edge Four-Stage Air Filtration System has 211.4 square inches of filtering surface, enabling MULTI-CUT saws to run up to 12 times longer than competitor's saws in hot (up to 1100°F) and smoke filled environments.

The new 2100 series includes two engine sizes: 70.7cc and 87.9cc.

Each engine is designed specifically for use with the Cutters Edge Carbide-tipped BULLET Chain and will cut a wide range of materials found at fireground and rescue scenes. Cutters Edge 2100 Series MULTI-CUT saws can be used for many operations including: rescue cutting, ventilation,



extraction, forcible entry, storm damage, crash rescue and more. Today's 2100 Series saws have undergone 29 improvements since their introduction in 1987 and many of these improvements were suggested by firefighters.

In 1993 Cutters Edge introduced the BULLET Chain, the first carbide-tipped chain specifically engineered for fire rescue cutting. Today it remains the only carbide chain manufactured specifically for fire rescue cutting – not just a modified wood cutting chainsaw cutter.

The BULLET's unique design and "filing action" revolutionized fire rescue cutting technology and it is the most widely used cutting chain in the world that can cut a wider range of materials and lasts longer than any other chainsaw chain. In addition, the BULLET Chain is also the safest chain. Certified test results, performed in accordance with ISO 9518, by the Swedish Test Institute, showed the BULLET Chain has 67% less rotational kickback energy than standard chainsaw chains and is considered an "extremely low kickback chain". The BULLET Chain is capable of cutting routing nails, joist hangers, nailing plates, flashing, light gauge sheet metal and lightweight concrete. It also cuts automotive sheet metal and glass, hurricane glass, bullet-proof glass, plastics, glass fibre and many other composites; including aircraft skin and cockpit and aircraft window glass.

Additional MULTI-CUT Fire Rescue Saw features include:

- Tool-less Guard/Depth Gauge for increased safety and precise cutting depths
- Full-wrap handle
- Fire Glove D-Handle Starter Rope Pull
- New Reflective labels help locate saw easier in dark and smoke
- Guard Deflector
- Chain brake – stops chain in 1/20th of a second
- Tool-less carburetor compartment entry for fast access, inspection and maintenance
- Compression release – reduces starting resistance by 40% for easier starts
- External side-chain tension adjustment
- Multi-function "Scrench Tool" attached to saw handle
- Large capacity petrol and bar and chain oil lubrication reservoirs

All three (2166, 2172 and 2188) MULTI-CUT models are available in a custom built diamond plate aluminum field kit box that contains everything needed for fire rescue cutting anywhere. **IFF**



For further information go to
www.cuttersedge.com

K V Fire - A major Force in the International Marketplace

For more than two decades, K V Fire Chemicals has specialised in the manufacture and supply of firefighting and fire suppression chemicals, in particular powders and foam concentrates.

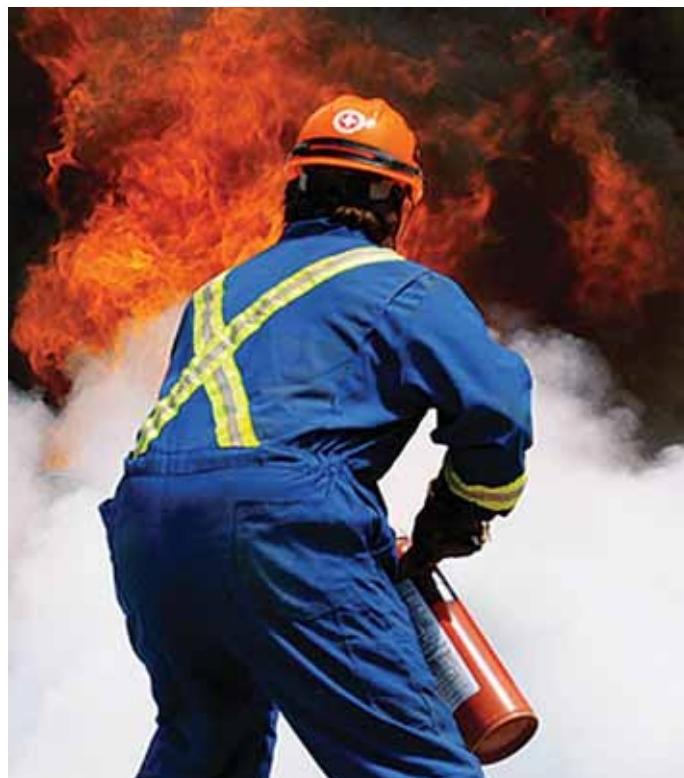
In addition to being one of India's premier specialist fire protection companies, K V Fire Chemicals has created a considerable presence, particularly throughout the Asia Pacific region and the Middle East. It currently has a customer base spread across 38 countries and has ambitious plans to develop other markets across the world.

Today, its key markets include the petrochemicals industry, defence, aviation, power generation, manufacturing industries, maritime applications and both municipal and industrial fire and rescue organisations. In addition to its core products of powders and foam concentrates, the company's expanding portfolio includes: portable fire extinguishers; foam production, storage and delivery hardware; and the latest development – water mist technology.

The K V Fire Chemicals foams offering includes, among many others: AFFF concentrates; Class A concentrates; an HEF concentrate developed specifically for fighting engine room and aircraft hangar fires; and a Class K foam for oil and fat fires. In terms of foam generation and delivery hardware, the company's comprehensive line-up embraces: foam makers; sprinklers; chambers; bladder tanks; and bladder proportioners. The company also manufactures a mobile foam delivery unit that comprises a foam inductor, foam branch pipe, a concentrate storage tank and two lengths of fire hose.

The current widely-approved dry powder offering from K V Fire Chemicals includes the UL Classified KV Lite POWEREX, which is now used extensively by its customers in portable fire extinguishers, fixed delivery systems and power cannons. The company's portable fire extinguisher range includes both standard fire risk and special application models that are UL-listed and come with a six-year guarantee.

The latest addition to the K V Fire Chemicals portfolio is a water mist system – the K V Fire Ultra Mist system – which is available as a portable



15-litre (30kg) back-pack system or 50-litre (100kg) trolley-mounted unit. Both of the low pressure systems are dual mode and can deliver the water mist as either a jet or a fog.

This clean agent water mist system reflects the company's on-going commitment to developing, manufacturing and marketing fire suppression and fire extinguishing solutions with the least possible negative impact on the environment. It also reinforces the company's growing international reputation for manufacturing excellence and producing systems and products that represent value for money, robustness and low in-use cost.

The company, which was established in 1988, is headquartered in Navi Mumbai with a 20,000 square metre manufacturing, logistics and development facility in Mundhegaon, Nashik. The company is certified to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007. **IFF**

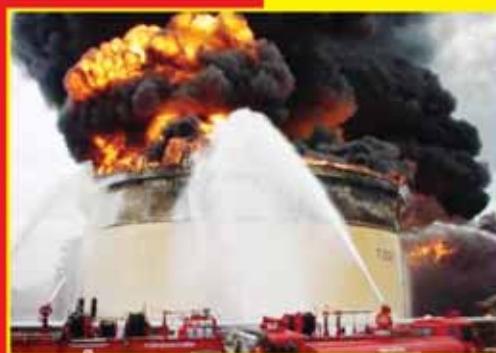


For more information, go to www.kvfire.com



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• KV-LITE FFFF	Aviation	• KV-LITE ABC	Multipurpose Commercial Risks
• KV-LITE FPAR	Marine	• KV-LITE PBC	Medium Industrial Risks
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• KV-LITE HF	Hazardous & Toxic vapours	• CLEAN AGENT FE 36™	UL, Safe Halon Replacement
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RTC - A casualty point of view...

"During the first rescue, there was a loud bang and all of a sudden glass was raining down all over me. The glass went into my ears, fell under my safety glasses onto my face and was all through my hair."

The next rescue, the crew used Packexe SMASH. The difference was phenomenal. Not only was the noise of the glass breaking greatly reduced, but there were no shards of glass falling on me and I felt a lot more safe and secure. I didn't need to worry about glass shards or sharp edges.

It was great!"

Steff Dewhurst, Bhsc Paramedic Student, Wellington, NZ,
Casualty at the World and Australasian Rescue Challenges 2011

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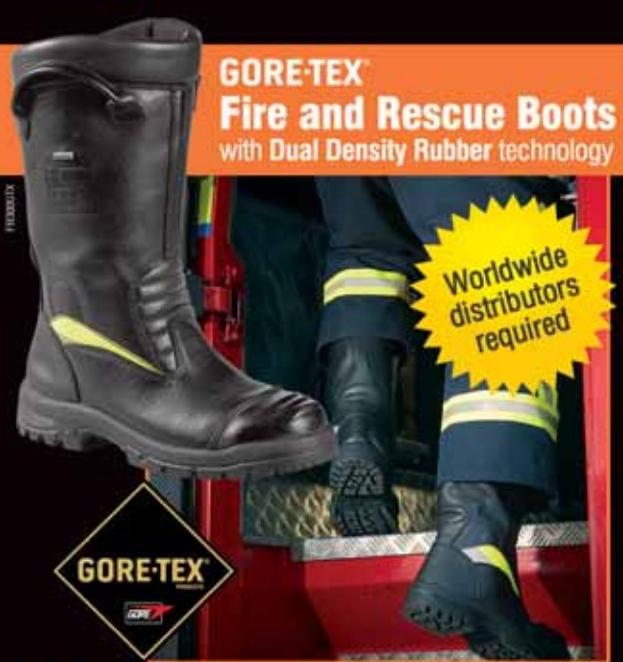
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Safer Extrication with RTA App

Extraction Zones is a patented app for emergency first responders at the scene of a road vehicle accident, which is available as a download to the iPhone, iPad, iPod touch (requires iOS 3.0 or later) or any Android powered smartphones or tablets.



By clicking on the app and selecting the make and model of the damaged vehicle from an extensive databank in a pop-up list, the side and top view of the specific vehicle will be displayed. It will show all of the areas of concern that are crucial to a safe and efficient extrication of trapped victims, including ultra-high-strength structural reinforcements, high voltage hybrid batteries and high voltage cables, airbags and airbag canisters, seatbelt pre-tensioners, fuel tanks, and 12 volt batteries.

A second and more complete version of the app has been released by EXTRACTION ZONES LLC called Extraction Zones Pro that features an additional 150 vehicle makes and models, increasing the original Extraction Zones databank of vehicles by over 300 percent. Extraction Zones Pro improves on the original version with the addition of entire production lines from many popular manufacturers.

The vehicle schematics allow the user to see immediately all dangerous areas that they are attempting to avoid. The app also features accompanying notes specific to the model, providing additional helpful information such as the amount of time the high voltage lines or the SRS system will continue to carry a power current after being disengaged.

For more information, go to www.extractionzones.com

In Safe Hands

Hand protection specialist, POLYCO, has expanded its range of hand and arm protection with the introduction of the Front Line range, which incorporates the very latest materials and advanced technology to respond to the needs of the emergency services and guarantee results in both safety and efficiency.

The additions to the Polyco line-up include an urban search and rescue and extrication glove that is made using Hexarmor SuperFabric, which has been designed to offer the highest available level of cut and abrasion protection. The ergonomically designed, breathable shell of the glove ensures superior fit, helping to combat hand fatigue. The Granite 5 Beta glove has also been designed to offer high levels of cut resistance and comfort, with the incorporation of Kevlar thread in a soft leather shell, while the Freezemaster II is the latest hand protection product from Polyco. It provides emergency services wearers with what Polyco claims is unparalleled protection from extreme cold and wet environments.

For more information, go to www.polyco.co.uk



New Robotic Vehicle

Specialised robotic and remotely controlled vehicle manufacturer, DOK-ING, has launched its latest multifunctional robotic firefighting system called the MVF-5.

In addition to inbuilt water and foam firefighting equipment, the MVF-5 has, as standard, a front-mounted rotational gripper combined with a dozer blade. The MVF-5 can lift up to two tonnes with the rotational gripper to remove dangerous objects, while the gripper can penetrate buildings and cut wires. The dozer blade can push up to 10 tonnes of debris.



The MVF-5 operator remotely controls the vehicle from a distance of up to 1500 meters. A video system comprising five waterproof high-resolution cameras enables direct control of the vehicle, while the incorporation of thermal camera enables operation when visibility is reduced.

Currently, more than 95 percent of Dok-ing's production is exported to countries such as Angola, Afghanistan, Iraq, Ireland, the Russian Federation, USA, Sri Lanka, Sweden and South Africa.

For more information, go to www.dok-ing.hr

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RESQTEC was founded in 1972. Originally named Zumro we were the first world partner with Hurst Performance and developed the first hydraulic rescue tool together, the legendary 32.

The 32 was originally developed only for emergency support at racing tracks, but Zumro had the vision of the potential benefits for fire and rescue services. In the beginning there was little interest in the rescue tool but after giving many demonstrations, the first sale finally came in France, followed closely by Germany.

With a lot of innovations over the past 40 years among them the Confined Space Cutter, NT Lifting Bags, Aircraft recovery system R2s and the all new Octopus system, we know what we are talking about in Rescue!

The future, Octopus Heavy Rescue system

PROFIX MAX, one shoring device that does everything better.

As basic product in the RESQTEC Octopus system, the strut is the most capable shoring device, unmatched in capacity ease of use and safety. The unique automatic interlocking device allows it to be used for lift support, stabilization, moving and trench! It can be operated pneumatically, mechanically and hydraulically by a V-series Ram.

NT LIFTING BAG SERIES, making lifting easy

The Lifting Bag NT-Series has proven to be the solution for lifting and creating space between structures. NT-Series can lift cars, trucks, trains, subways and collapsed buildings with ease and control like no other system. It is the answer to the



limitations and complexity faced with conventional lifting equipment.

Cribblock – Series, fastest way to stabilize a load

The CribBlock-series are a must have for the professional rescuer. The reason is simple: stabilization is essential in rescue to prevent movement during extrication. Nothing can do it better, easier or faster. The different elements, all with interlocking design, create different stabilization structures easily.

RAM V-SERIES, Highest performing ram ever developed

A ram is used to create space over a long structure. The Ram V-Series is engineered to create space easily; it has a long stroke and the unique 4-point jaws give optimum grip on the object. Use the Ram adaptor to attach the ram to the Profix Max strut for more length.

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For more information, go to
www.resqtec.com
For any questions, contact
info@resqtec.com

Panthers on the Prowl

A number of ROSENBAUER 12,000-litre Panther CA5 vehicles have been added to the Malaysia Airports Holdings Berhad (MAB) fleet of firefighting vehicles. Four units have been delivered to Langkawi and four to Kota Kinabalu International Airports, plus a further four will be delivered to Penang and Kuching by the end of November with another three units for the new LCC hub at Kuala Lumpur International Airport (KLIA2) being delivered by the end of the year for operation on the third runway.



The MAB supply contract includes a 15-year maintenance programme, which will be undertaken by Rosenbauer's local partner in Malaysia, UMW Equipment, utilising its branch network throughout East and West Malaysia. All the units are fitted with Service4Fire connectivity to enhance the availability and reduce service time, as well providing MAB with a real-time perspective of the status of their trucks.

Also on its way to Hong Kong International Airport, a CA5 joins existing Rosenbauer vehicles at the airport and acts in the role of a rapid intervention vehicle (RIV). Operating with a water tank capacity of 9000 litres this Euro V engined Panther can reach to 80 kilometres-an-hour in 25 seconds in accordance with ICAO standards. It is fitted with a Halotron extinguishing system, which is particularly relevant for tackling aircraft brake fires where ceramics are used.

Rosenbauer says that by utilising a box frame for the chassis and the rigid axle with coil spring suspension, the Panther combines extraordinary cross-country ability with safety, while giving a comfortable ride for the crew. Unlike other suspension types, such as leaf springs and independent suspension systems, the flexibility of the rigid axle coil spring design enables the Panther to zigzag down a debris-strewn runway, which is the role of the first response RIV.

The complete firefighting system in all the Panther trucks is designed and manufactured by Rosenbauer, from the pump to the foam mixing, monitors, hose reels and control systems. This culminates in a seamless operation, allowing the operator to concentrate on his job, rather than trying to control everything from his console.

For more information, go to www.rosenbauer.com

Seeing the Light

PELI has unveiled two new LED torches – the 1910 and the 1920.

Powered by a single AAA alkaline battery, the Peli 1910 LED weighs in at just 40 grams (including the weight of the batteries) and provides LED illumination that delivers 39 lumens for one hour of battery runtime. Weighing in at 62 grams (again with the batteries), the Peli 1920 LED utilises two AAA alkaline cells and a single, next-generation LED to emit a ANSI FL-1 standard 67 lumens for nearly three hours of runtime.

Both torches feature a removable metal clip and are weather and corrosion resistant with a tough Type II anodized, "no-slip" matte finish to their aluminium bodies. Each has a tail cap switch with momentary and on/off function.

For more information, go to www.peli.com



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- swiftwater rescue with R3(UK)
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- animal rescue.

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Tim Mockridge

Devon & Somerset Fire and Rescue Service Maritime School



Safety at Sea

How seriously do the world's ship owners take the threat of fire, and how well trained are the crew?

At around 23:00 on December 22nd 1963 Captain Mathios Zarbis was watching the passengers enjoying themselves dancing at the Tropical Tramps Ball in the main ballroom of the TSMS Laconia 180 miles north of Maderia.

Unbeknown to Captain Zarbis and all on board, a string of events had started to unfold that by the end of that night would see the total loss of the ship and the lives of 95 passengers and 33 crew members.

Just before 23:00 the steward noticed smoke seeping from underneath the door of the hair salon. Upon opening the door he found the room completely ablaze and attempts to tackle the fire and stop it spreading with fire extinguishers proved futile. The fire alarms were operated, but were not audible enough to be heard. The first indication of the fire to the rest of the ship was smoke pouring into the ballroom.

As passengers from the ballroom attempted to get to the boat deck, those roused from sleep in their cabins were wrongly directed straight into the path of the fire. Between 23:30, when the first distress call was made, and the last signal indicating the abandoned ship only 52 minutes lapsed. Despite individual acts of great bravery, such as the swimming pool attendant and a steward being lowered down the slide of the ship with ropes tied around their ankles to snatch trapped children from cabin portholes, the crew failed to bring the fire under control or even stop it rapidly spreading to other decks.

Only half the lifeboats made it away safely; some burned, and two spilled the occupants into the sea. Over 100 people were trapped on board in the glass-enclosed Agora Shopping Centre until eventually the flames closed in on them, when they lowered the gangways and quietly walked single file into the sea.

Between 03:30 and dawn, the rescue of the passengers was carried out by the ships Salta Mont Calm, Charlesville, Rio Grande, Stratheden, Mehdi and four United States Air Force G54 aircraft that dropped life rafts and survival kits. Despite the intervention of so many ships, many people died in the sea that night.

Learning the Lessons

This and many other devastating fires on vessels and a rising death toll on passenger liners throughout the world led to calls for increased safety at sea legislation. The IMO, formerly the IMCO founded in 1948, had only just adopted a new convention for the safety of life at sea, SOLAS, in 1960, but the loss of vessels was still increasing. It took years of legislation before a major revision of the STCW 1978 came into force. This was further amended by the STCW 1995 Convention.

The content of the Fire and Safety at Sea Legislation Regulations of the STCW Codes are the main focus in the day-to-day work carried out at the Maritime School in Plymouth in the UK. The school has been in existence for over thirty years

MARITIME FIREFIGHTING



and comes under the remit of the Training Academy Division of Devon and Somerset Fire and Rescue Service. The Maritime School's STCW curriculum has recently been re-accredited by the UK Maritime and Coastguard Agency after changes had been made to the course contents. While still adhering to the STCW regulations, we have introduced new firefighting, ventilation and command and control techniques employed by international fire and rescue services. These procedures include basic fire behaviour skills, such as recognition of potential flashover and backdraft situations, and the ability to control the environment with advanced branch techniques and basic tactical ventilation.

The School's facilities, in addition to lecture rooms and breathing apparatus training facilities, include a demonstration room to enable students to witness the live actuation of sprinklers, inert gas flooding, foam and high pressure fog extinguishing systems. There is also new specialist rescue and confined space towers for the use of students on other academy courses provided by the Access and Rescue School, or to allow students on maritime courses to practice ship-to-ship access.

The ship firefighting structure is a steel, multi-

compartment structure including machinery spaces with fixed equipment and varied-level gantries with multiple access points. The main success of the School comes from its ability to conduct carbonaceous burns, not gas. This provides students with a greatly enhanced level of realism during firefighting and the ability to control the conditions themselves using fire behaviour techniques and ventilation.

The Maritime School offers a full spectrum of courses starting with a one day marina firefighting course aimed at people who have responsibility for the running and security of boat marinas.

The one day boat master's course is aimed at day boats, fishing boats and private boat owners. The day is divided into a morning's theory input of fire safety and fire prevention and an afternoon's basic firefighting with extinguishers and small hose reels.

STCW 95 Courses

The full STCW 95 basic course is offered starting with a one day personal survival techniques, run in partnership with Maritime Survival Solutions. The second day is the basic first aid, which can be delivered in its basic form or tailored for the security industry to incor-

porate more trauma-related emergency medicine, such as the use of advanced airway management, tourniquets, haemostatic agents, and casualty transfers.

The Personal Safety and Social Responsibility element of the course is offered in the evenings, leaving the last three days (or two extended days) for the basic firefighting.

Day one is basic theory input followed by practical extinguisher firefighting. The last part of the day covers hose, ladder, door and hatch entry techniques. Day two starts with the theory of breathing apparatus and breathing apparatus physiology. The first breathing apparatus exercise is a simple route finding exercise in darkness followed by a breathing apparatus exercise within the ship structure in cold smoke and darkness. The final exercise of the day is a breathing apparatus exercise in heat levels with live fires. The students practice hose and branch techniques, door and hatch entry while working in teams in realistic fire conditions.

The last day covers firefighting tactics and fire party operations and also has a basic input into fixed firefighting installations. At this point in the course the students then witness a live fire

demonstration, a fixed installation such as sprinklers, foam, inert gas and Hi-fog systems.

For the final afternoon's exercise, students are divided into fire parties and a scenario developed for a serious multi-seated fire aboard with a number of casualties reported missing. While the students are encouraged to make their own firefighting decisions during the exercise, the general instructions and guidance are delivered by the staff instructors. Each firefighting team is accompanied by a safety officer at all times. The staff member is primarily there as an observer and will only influence the firefighting teams if they put themselves at risk. Safety officers are in constant

day two to give both the students and the staff an understanding of the knowledge level of students so that the staff are better able to tailor the learning outcomes.

The remainder of the course concentrates on tactics carried out in the live fire environment and in small groups using ship plans with students pitting their wits against the staff instructors who set and direct the scenarios.

Students on the advanced course also receive further instructions on board advanced fixed installations such as HiEx foam, forced ventilation fans, water removal and stability. Half a day is given over to table-top command and control

Each firefighting team is accompanied by a safety officer at all times. The staff member is primarily there as an observer and will only influence the firefighting teams if they put themselves at risk.

communication with an outside control room via radio and use thermal imaging cameras with transmitters to record students' actions.

The final exercise is followed by a long and detailed de-brief using plans, thermal image film and safety officer's observations to reinforce the course teaching outcomes.

STCW 95 Advanced Firefighting

The advanced course refreshes the techniques learned on the basic course and a similar exercise to the basic final exercise is run for students on

exercises to further enhance the capability of ships' officers to command a rapidly escalating fire situation. The aim being to control the situation with minimum risk to the crew and reducing loss to ship owners and insurers. Time is also given to understanding the regulations and legislation as they apply in the maritime world.

The Piracy Fire Threat

Recent changes in the global maritime world have highlighted the dangers of piracy. Soldiers and marines are leaving the military service to join one

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of the many maritime security companies and embarking on a new career to protect the world's shipping from pirates. There is an obvious increase in the risk from fire aboard resulting from pirate attacks and a need for the security staff to be fully trained in firefighting techniques and in many cases take a lead role in firefighting operations on board. Indeed international maritime organisations are bringing regulation into force to make STCW 95 basic firefighting training, *inter alia*, compulsory and both companies and individuals will find the qualification a pre requisite for employment in the security industry.

Throughout the course of working at the Maritime School, staff have made many observations. The most common observation is the absence of an STCW 95 refresher requalification. There are not many industries where a single training course is deemed sufficient for a lifetime, particularly when such obvious changes in techniques, vessels, and risks have come about over the years.

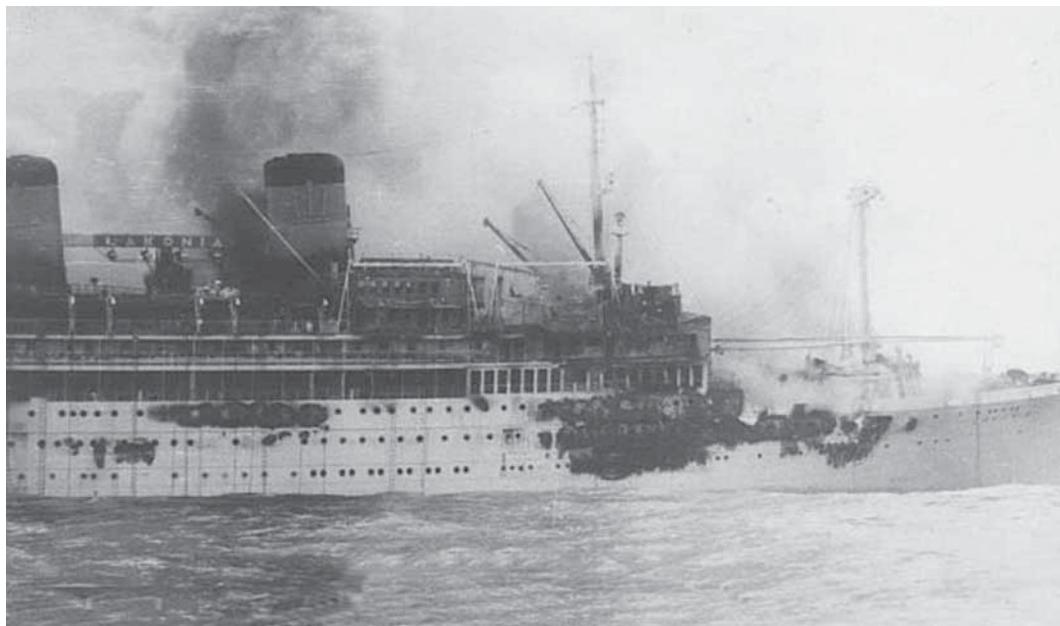
The Future

We can only speculate on the outcome of the *Laconia* fire if it had happened today and she had been fitted with a modern automatic fire detection system and if the fire awareness among the crew had resulted in the steward who discovered the fire keeping the compartment door shut until a fully equipped firefighting team using CABA sets, fire behaviour branch techniques, thermal imaging cameras and radios to assist in command

and control and a high degree of training took over. Perhaps the implication of a fire safety culture on board may have meant that the fire may never have started.

Throughout the course of working at the Maritime School, staff have made many observations. The most common observation is the absence of an STCW 95 refresher requalification. There are not many industries where a single training course is deemed sufficient for a lifetime, particularly when such obvious changes in techniques, vessels, and risks have come about over the years. How many officers and crews of ships

can remember back to their initial firefighting course and feel they can confidently tackle a fire on board? It is the intention of the Plymouth Maritime School to take this issue forward for debate. In the short term, the School will be designing a one-day STCW95 refresher/re-qualifier, where students can practice the ship's firefighting procedures together in a live fire environment and benefit from the input of professional fire service advice.



Even as I was writing this article, news arrived about a fire on board the Norwegian cruise ship, Nordlys, sailing from Bergen to the Arctic Circle. When a fire and explosion on board killed two of the crew and injured nine. Over 260 passengers were evacuated from the vessel and the possibility of her sinking was only avoided after she was towed into harbour. This difficult fire was tackled by over 50 crew members and

professional firefighters from Norway. If this can happen on a vessel with some of the best trained crews in the world, in a country with some of the strictest safety regulations, than we can only speculate on the risks some of the world's shipping is facing.

One thing is certain knowledge, training, equipment and practice can go a long way towards the protection of lives from fire at sea. **IFF**

Tim Mockridge is joint-manager of the Devon & Somerset Fire and Rescue Service Maritime School

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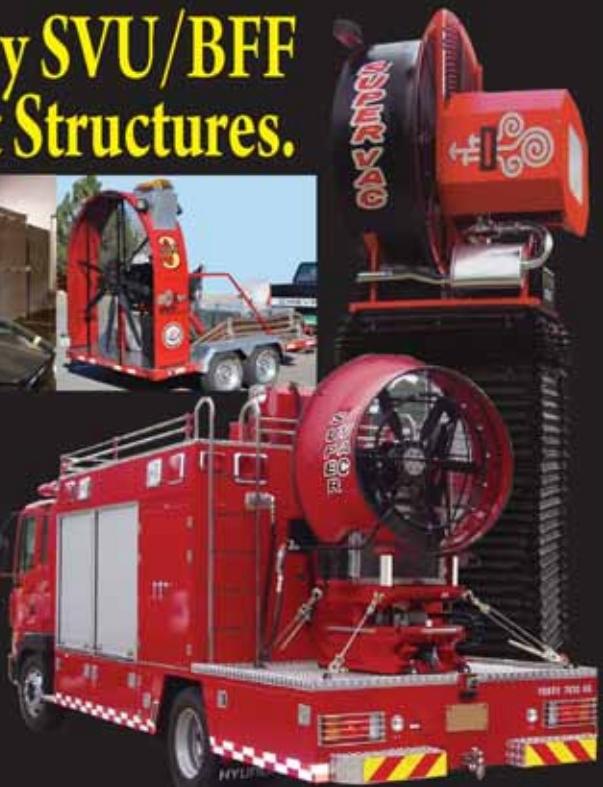
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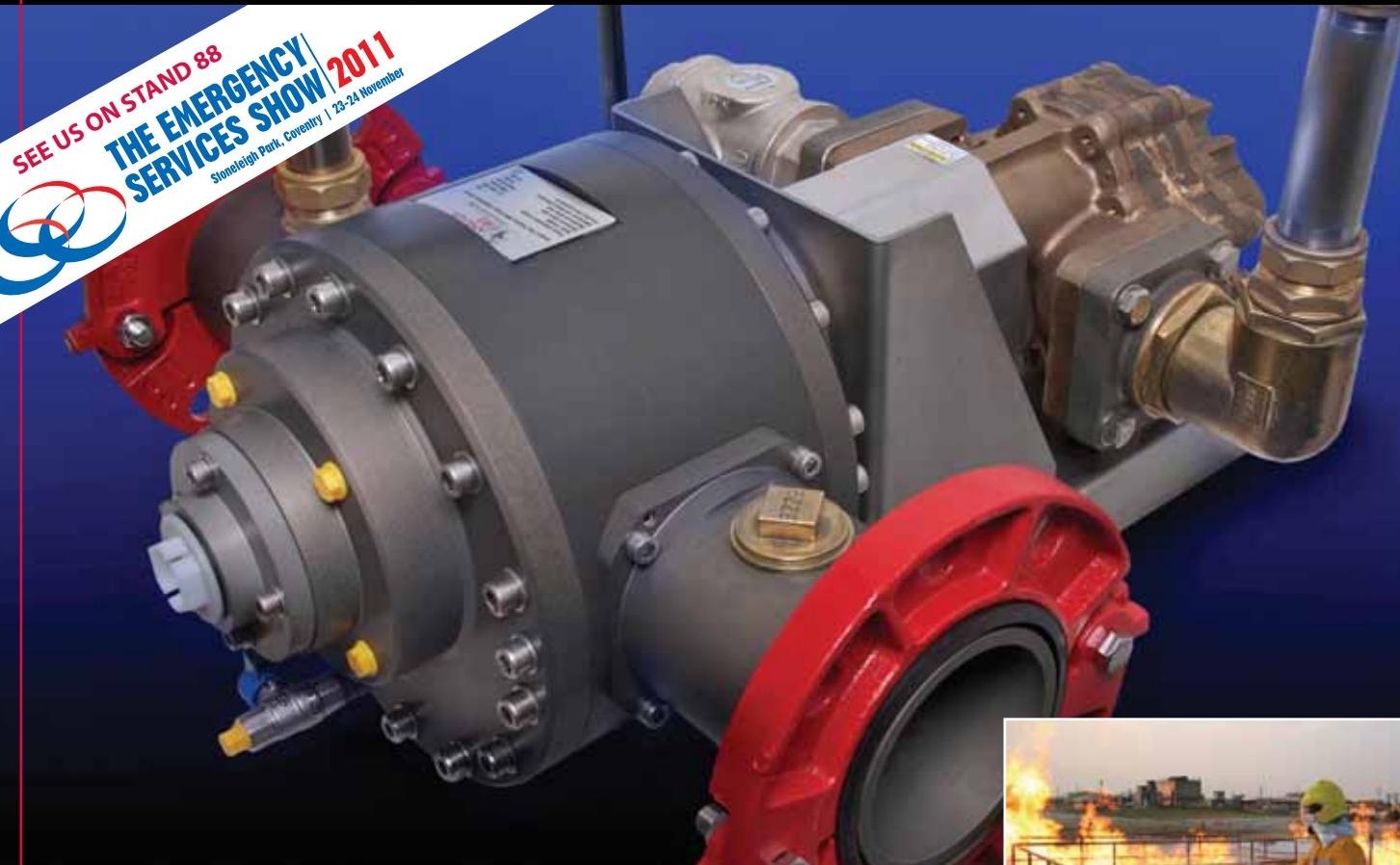
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SP Fire Technology

Ethanol – Providing Answers to New Firefighting Challenges

The use of ethanol has increased significantly, creating new challenges for first responders. So much so that SP Fire Technology and the Swedish Petroleum Institute have taken the initiative and developed a proposal for a research project on ethanol tank firefighting called ETANKFIRE.

In the 2007 Spring Council, the EU agreed on targets to cut greenhouse gas emissions by at least 20 percent by 2020. To have such an impact on the environment and reach the emission targets it is essential to have a successful introduction of a broad bio-based economy, which includes the use of ethanol fuels.

The main use for ethanol is for low blending in petrol, but it is also used as E85 and "diesel ethanol". From this year, the acceptable proportion of ethanol in low blended fuels will increase from five percent to ten percent in Europe. Similarly, in the USA, the use of ethanol fuels has increased dramatically during the last decade, where presently the ethanol content in the gaso-

Ethanol and Petrol

Ethanol differs from petrol in several important ways.

The most significant differences in terms of fire performance relate to the ability to extinguish a fully developed fire using traditional firefighting methods. However, the flammability properties and the burning behaviour are also different and have to be taken into account both in pre-planning and actual incident management.

The most important differences from a fire extinguishing perspective are that ethanol is a water miscible fuel and the large fuel depth in a tank. Some test data concerning foam fire fighting of ethanol fuels and other water miscible products

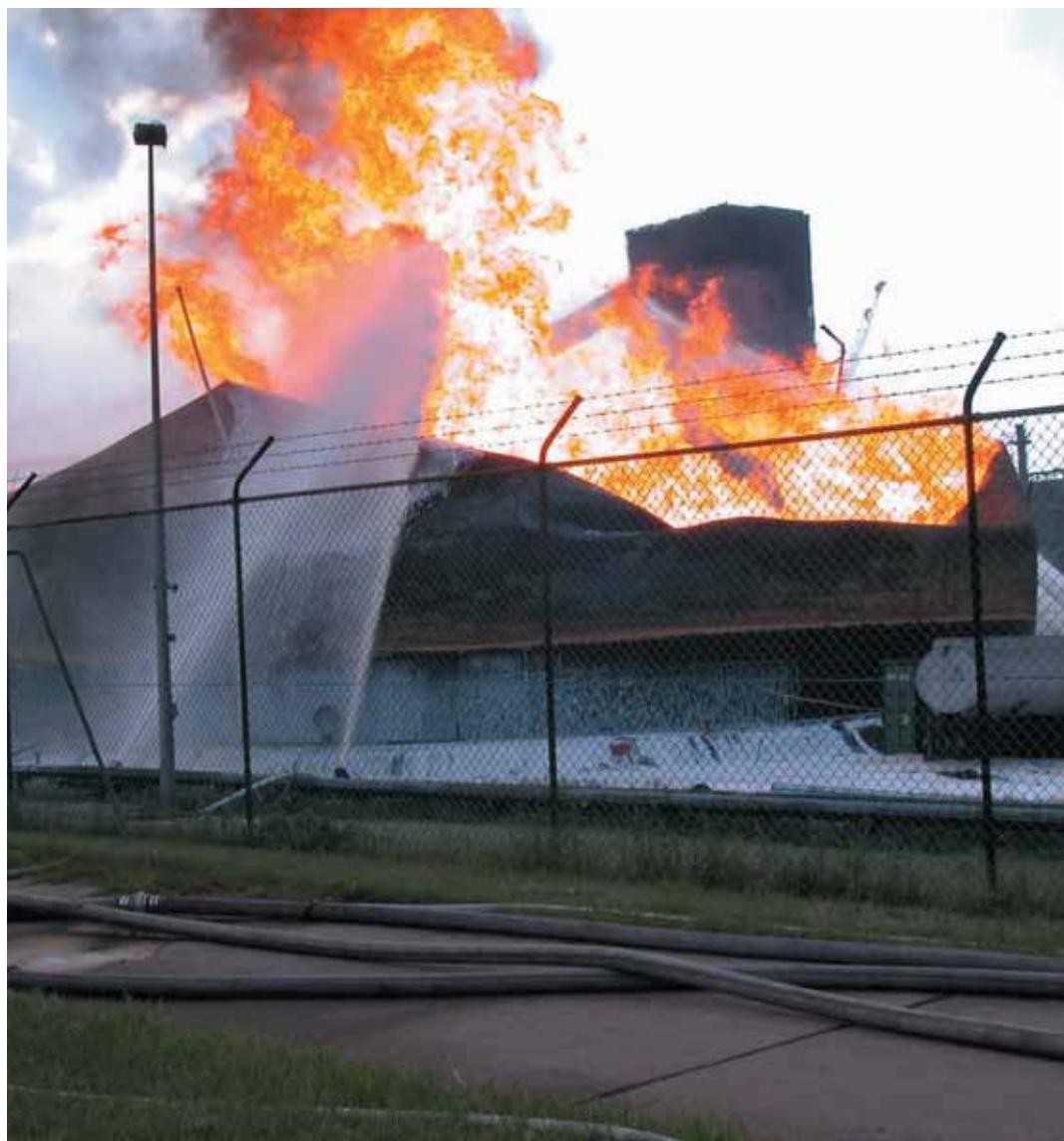
The obvious consequence of increasing the volume of low blended ethanol, both in Europe and the USA is that the volume of bulk ethanol transported, handled and stored will increase dramatically in coming years. The diameter or volume of the storage tanks is also increasing, making a fire and ensuing firefighting operations a significant challenge.

line sold is nominally ten percent but there are ongoing discussions to increase this to 15 percent.

The obvious consequence of increasing the volume of low blended ethanol, both in Europe and the USA is that the volume of bulk ethanol transported, handled and stored will increase dramatically in coming years. The diameter or volume of the storage tanks is also increasing, making a fire and ensuing firefighting operations a significant challenge. However, experience of tank firefighting involving ethanol or other water miscible fuels, is very limited and those few tank fires that have occurred have resulted in burn out rather than extinguishment.

is available, even for reasonably large scale scenarios, but they all represent spill fire conditions. During the last decades, SP has conducted several large test series using methanol, ethanol and acetone as fuels. Clearly these tests give important information but knowledge is still lacking concerning how to extinguish tank fires containing water miscible fuels.

The problems relating to firefighting ethanol fires has also been an important issue in the USA and a series of fire tests were conducted in 2007 according to UL 162 by the Ethanol Emergency Response Coalition (EERC). The tests on E95 showed that the requirements of UL 162 were



only fulfilled when using an AFFF-AR and Type II (gentle) application.

Further, existing test standards for alcohol resistant foam concentrates (such as ISO 7203-3, EN 1568-4, and UL162) represent spill fires as they all employ thin fuel layers and short pre-burn times. Even spill fires will represent a firefighting challenge, but provided alcohol resistant (AR) foams can be used and gentle application is possible, extinguishment is at least theoretically feasible.

In a closed vessel or a tank, pure ethanol forms flammable fuel vapours at a temperature range of about +12°C to about +40°C while petrol needs to be below about -20°C for this to happen.

However, as tank fires are usually extinguished using large capacity foam monitors, gentle application is not possible and therefore extinguishment cannot be expected. A tank fire presents a more severe situation compared to a spill fire due to the large fuel depth, which essentially removes or severely limits the dilution effect from the firefighting foam. Also the large physical dimensions of a tank make gentle application of the firefighting

foam impractical. Further, the pre-burn time is longer than that expected in a spill fire, thereby increasing the temperature of the fuel and creating hot steel surfaces making extinguishment even more difficult.

Other important differences compared to petrol relate to the flammability properties and burning behaviour of ethanol. In a closed vessel or a tank, pure ethanol forms flammable fuel vapours at a temperature range of about +12°C to about +40°C while petrol needs to be below

about -20°C for this to happen. Ethanol fuels, such as E85, have a flammability range between pure ethanol and petrol, the exact range depending on the specific composition. The consequence of this is that the possibility to create flammable conditions in a storage tank containing ethanol or ethanol fuels, and thereby the risk for ignition, is greater for ethanol compared to petrol.

The burning behaviour of ethanol is different to that of petrol in that ethanol typically burns more efficiently than petrol. This potentially translates into a significant difference between large scale ethanol fires compared to large scale petrol fires. The issue is further complicated by the fact that the size of the fire has an impact on the burning behaviour of the fuel.

Experience from small scale fires shows that radiation is lower from an ethanol fire compared with petrol. However, there are indications that the opposite may be true in a large scale fire based on observations made during a series of fire tests conducted on a 200 square metre mixture of acetone and ethanol. Measurements indicated that the heat flux from the acetone/ethanol fire was about twice that of petrol in this scale although petrol produced significantly higher heat radiation in small scale tests. The reason for this is probably that, as the scale increases, petrol fires generate increasingly large amounts of smoke that tend to block the visible parts of the flames thereby reducing the heat radiation.

An initial Steering Committee will be formed by those willing to participate in the funding of the ETANKFIRE project in order to take part in the final detailed planning, including the choice of venue for the large scale tests.

An acetone/ethanol fire is almost free from smoke, and the associated heat radiated is therefore not dissipated by smoke. It is not unlikely that this would also be true for ethanol fuels. Indeed, such observations were made during the Port Kembla ethanol tank fire. One consequence of this phenomenon could be an increased risk for escalation and an increased complexity in firefighting operations due to higher heat exposure of personnel and equipment.

ETANKFIRE

Although tank fires in general are rare, and the number of known ethanol tank fires to date is presently low, extensive fire protection measures will be required in storage facilities, based on various national laws and regulations.

Further, the number of ethanol tank fires will no doubt increase as the volume of ethanol used and stored increases in the future. Typically this translates into significant investments, both in preventative and risk mitigation measures, including preparations for firefighting in event of a full scale tank fire. However, as practical experience is very limited, and the standards for fire protection lack specific information concerning ethanol and similar fuels, there is a clear risk that such investments will not provide the fire protection level expected.

The main goal of the ETANKFIRE project is therefore to provide a platform of knowledge to ensure proper investment in the fire protection of ethanol storage plants.

This will involve gaining information both regarding the large scale burning behaviour of ethanol fuels and the development and validation of a methodology for firefighting tank fires containing ethanol fuels. In order to achieve this goal, it will be important to provide an under-

standing of the differences between conventional firefighting of spill fires when compared with tank fire situations containing water miscible products. The main differences that are foreseen are:

- Tank fires mean increased depth of fuel and less dilution effects during extinguishment.
- Longer pre-burn time increasing the fuel temperature and the foam destruction.
- Difficulty in achieving gentle application of the foam using the most common firefighting techniques (mobile foam monitors). This might require different equipment, tactics and perhaps even the use of other types of extinguishing media.

In order to optimise the test design in the project, the intention is to start with a test series on a laboratory scale to investigate the relative influence of the three factors mentioned above. Based on the results of laboratory tests, the most promising extinguishing methods or media will then be selected for further evaluation and verification in a larger scale or scales. Questions regarding the burning behaviour and heat radiation

from ethanol fuels will primarily be investigated in large scale tests. During the initial phase of the project, a literature review will be made to ensure that existing test data and experience from real tank fires is identified.

Although the project will be focused on ethanol-based fuels, it will provide important information that will also be applicable to other water miscible products.

International funding

The fire protection issues related to ethanol are international in character and the aim is therefore to involve stakeholders on an international basis. In order to present the ETANKFIRE project plans in more detail and discuss the plans with various stakeholders, various information activities are ongoing.

The project idea was presented to the LASTFIRE group in April and in June a workshop was held in London with approximately 35 representatives from the oil industry, fire protection companies and regulators. The workshop offered an opportunity for these stakeholders to provide input to the project plan in its present form and to identify themselves as potential participants and sources of funding of the project. A second workshop was recently held in US to reach out to North American stakeholders.

An initial Steering Committee will be formed by those willing to participate in the funding of the ETANKFIRE project in order to take part in the final detailed planning, including the choice of venue for the large scale tests. At present time, funding is secured from two participants (the Swedish Fire Research Board and SPI) and a number of other stakeholders have indicated a clear interest in participation. The aim is to launch the project early 2012.

Henry Persson is Project Leader and **Margaret McNamee** is Research Manager at SP Fire Technology

For further information, go to www.sp.se/en/index/research/etankfire



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Trauma Awareness in Firefighter Leadership Training



Piers Bishop

PTSD Resolution

Even seasoned firefighters are not immune to the threat of trauma. Everyone has their own individual breaking point. When scenes and experiences become too much, or perhaps occur too often in a short space of time for the individual concerned, the result can be depression and behavioural problems. Left untreated, these symptoms may produce avoidable accidents, extended sick-leave and eventually resignation or dismissal – and perhaps a major legal liability for the employer.

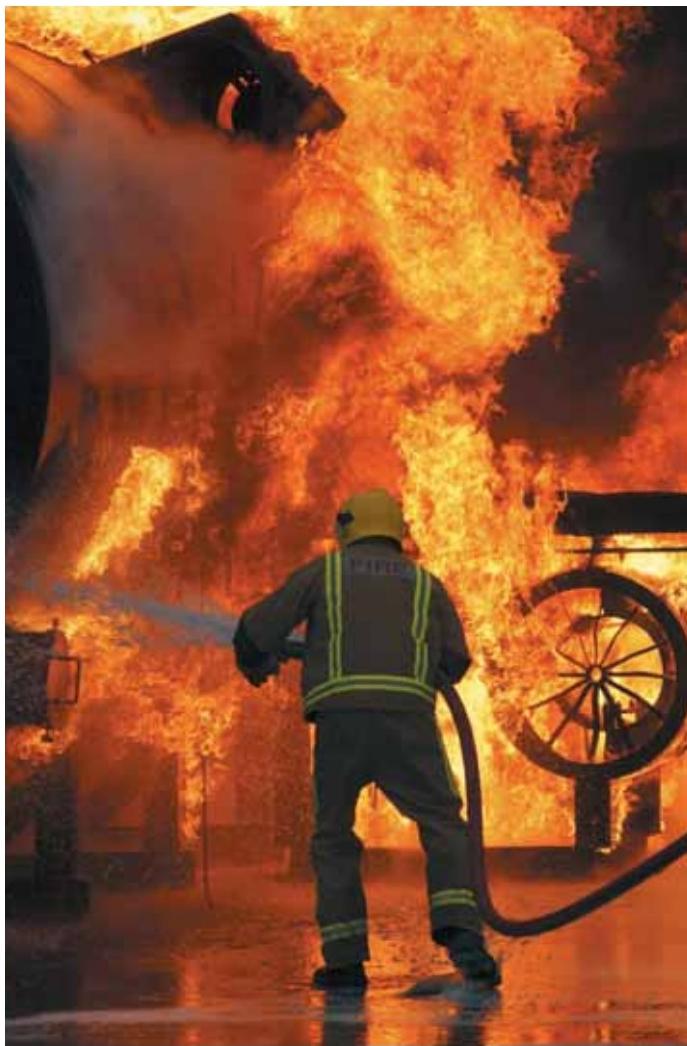
Too often the ‘human factor’ in team preparedness goes unaddressed in emergency and contingency planning. The best laid plans and most exhaustive drills often fail to take account of the uncertainties of human reactions and behaviour. Instead, organisations tend to rely on team building and a ‘macho’ culture to get through. Sometimes this is not enough. So what can managers and team leaders do to deal with the threat of staff trauma?

PTSD Resolution is an organisation dealing with trauma awareness and treatment on a daily

basis. In a typical case we received a telephone call recently from a firefighter who had been traumatised in a fire where burning bodies were discovered. He spent some time on sick leave, was eventually retired early and the situation turned into a battle with his employer – which has now also become a traumatic episode in itself.

This secondary problem arose because the fire service concerned did not have even the limited understanding of PTSD that the armed forces are slowly developing – particularly in the UK and USA, as a result of engagements in Iraq and Afghanistan.

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So, why does existing staff training fall short, and what needs to be done?

Firefighters are trained to deal with events that would induce trauma in most people. Part of that training involves behavioural conditioning through graduated exposure to events, so as to increase the ability to overcome a natural fear when confronted by the threat of fire or its consequences, including death and injury.

The core of a standard training regime is to provide the firefighter with a sense of control to meet most conceivable eventualities; to establish routines to deploy him or her into a situation in a controlled way, with maximum provision for personal safety. But sometimes events happen that are out of firefighters' control, such as explosions or fatalities – perhaps of close colleagues.

The traumatic effects of these challenges on each individual can be temporarily overcome, denied or suppressed by the person concerned. But sometimes a further event occurs that may trigger a noticeable reaction; and when such stresses are repeated too often, mental health issues may arise. The result can be debilitating for the individual concerned, and disturbing for family and work colleagues.

As a charity dealing with veterans of the UK armed forces who are traumatised, we meet ex-military personnel who are trained for combat, but repeated or excessive traumatic exposure has led to stress disorders. Eventually, if not understood

and dealt with, these suppressed fears overwhelm a person's self-control and emotional health. That is why all team leaders and employers need to understand how to recognise post-traumatic stress, and where to get help, sooner rather than later.

Many of the military traumatic experiences with which we deal involve fire. The firebombs and incendiaries in Northern Ireland, or the explosive devices and consequent burning of vehicles, people and buildings in Iraq and Afghanistan for example. One of the most noticeable features of fire is the smell, and the most primitive and earliest sense to be activated is the olfactory sense. It is often the smell that will trigger a fear reaction or memory first of all.

Trauma changes people in many ways – it can make them more aggressive, angry, nervous, depressed, vigilant, guilty, paranoid or any combination of these, as well as causing extraordinarily vivid flashbacks and nightmares where, as far as the sufferer is concerned, he or she is reliving the original experience. This can be hell – for the one who is experiencing the problem and for everyone around him or her. Many sufferers stop going to work or going out at all in order to avoid the triggers.

While trauma is usually caused by being involved in or witnessing events that involve actual or potential death or injury, it is important to recognise that in many cases there are initial symptoms that may subside over a few days or weeks. It is a natural coping mechanism. This means that it is usually best to let this process happen by itself – 'critical incident debriefing', where everyone involved in an incident is given counselling, is now thought to cause more problems than it solves.

However, if the symptoms have not subsided after a month, or have got worse, it is time to do something about it.

Trauma Tips

If you have staff that have been exposed to violent scenes, or are going to come across them, they need to be educated in these facts through the correct training:

- 1 There is a chance that in the past, or as a firefighter now, you are or will be affected adversely by the things you see and do. This is normal, and the emotional effects will fade in many cases. If there is no reduction after a month or so, or the condition is getting worse, it is a good idea to get help.
- 2 You are not going mad and this is not a sign of weakness. It is a normal reaction to events and can happen to anyone, even the most robust and apparently stable individuals. Everyone has a threshold beyond which they can be traumatised.



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- 3 It is ok to talk about it, but it will not necessarily help. Treatment is what you need. The sooner you get on with it, the sooner you will be able to get back to normal life.
 - 4 Your usual doctor probably will not be a trauma specialist. In fact you may know a great deal more about post-traumatic symptoms than your medical practitioner, because of your experience of disturbing incidents and the effects on colleagues. Contemporary medical opinion does not in most cases recommend medication for post-traumatic symptoms, but many doctors still offer antidepressants to new trauma cases. Insist on a referral.
 - 5 There is a strong probability that with appropriate treatment you will experience a good recovery.
- Managers and team leaders should develop a culture that is responsible not macho: firefighting equipment is maintained regularly and repaired when necessary, so it is rational to adopt the same approach with your people, at the very least.
- If you manage firefighters who may experience trauma, keep an eye on their behaviour. If someone is involved in an incident and seems to have changed, it may be a sign that they will need help. Let them know that you are aware of what they have been through; that the organisation's policy is to be open about stress reactions and to get help if necessary so that everyone can continue to work well. If the team member does not seem to be returning to their normal attitudes, demeanour and behaviour after a few weeks, open a dialogue about how they would like to be helped to recover.

Develop a relationship with an organisation like PTSD Resolution that has experience of severe post-traumatic reactions and can deliver brief interventions that return people to work. The cost of a typical course of treatment should be very much less than the expense of supporting an unwell employee down the line – or worse still coping with the collateral damage if someone



does something unfortunate while traumatised in your employment.

Trauma Treatment

Fortunately effective treatment is now fully available. The therapy that PTSD Resolution uses is Human Givens Therapy (HGT). Used in psychological trauma as a form of Trauma-Focused Cognitive Behavioural Therapy (CBT), this treatment for PTSD is consistent with national guidelines in many countries, including the National Institute for Health and Clinical Excellence (NICE) in the UK.

The goal of therapy is to enable the person to remember the events that may have caused the traumatic memory but with emotional detachment – so that they are not ‘re-living’ the event compulsively. This is achieved by asking patients to recall the events while in a deeply relaxed state during a treatment session; enabling them to understand their reactions and the processes involved. Treatment is repeated and any adverse reactions are noted and measured until both patient and therapist agree that no further support is required – usually within three to five one-hour sessions.

Patients are not required to talk about the incidents concerned, which otherwise tends to reinforce the traumatic memory. Instead, the programme policy is that re-exposure is better done in the client’s visual imagination and while in a relaxed state, protecting confidentiality and reducing distress.

Overall the programme has had a better than 83 percent success rate in resolving the condition for the 150 UK veterans of the armed services treated in a pilot programme. This is similar to the recovery rate in the recent study of 599 stress-related cases from the general population who were treated using HGT: over 70 percent reached a significant and sustained improvement after an average of 3.6 treatment sessions.

Employers' Training

Recognising the needs of employers in firefighting and other sectors to deal with the problem of trauma, in 2011 PTSD Resolution developed a one-day training programme for employers, so that line managers and human resource professionals can proactively identify trauma symptoms.

This trauma-awareness preventative training enables organisations to meet their responsibilities and statutory obligations – and avoid the operational impact and personal cost of staff trauma. The goal is not to create ‘experts’, because this is not necessary – but to enable managers to confidently identify a potential problem and take action to resolve the situation.

The PTSD Resolution TATE one-day programme in London deals with the key issues for managers and HR professionals. It enables them to: recognise post-traumatic symptoms and PTSD; understand the effects of trauma on human behaviour; engage with traumatised people to discuss practical options; and identify a clear route to resolving workplace difficulties caused by trauma. **IFF**

Piers Bishop is director of therapy at PTSD Resolution (charity No. 1133188)

For further information, go to www.ptsdresolution.org/
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Graham Collins

Storage Tank Fire Protection

A storage tank fire is the nightmare scenario. Avoiding them demands careful risk assessment and thorough planning, while fighting storage tank fires calls for exceptional skill and the best available equipment, systems and products.

Undoubtedly, the most tried-and-tested method of safeguarding storage tanks is to protect them with fixed foam systems, in part because they do not demand the hasty marshalling of emergency equipment and manpower. Rather, they stand guard in constant readiness. Certainly, there are a number of system options available on the market, including those for cone roof and fixed roof tanks, open-top floating roof tanks, covered floating roof tanks, and horizontal tanks.

However, there is a "but". Storage tank fires have the nasty habit of starting with an explosion, or very soon resulting in one that may seriously damage the tank structure and completely destroy the foam generators used in fixed or "over-the-top" systems. This has resulted in the development

and more widespread use of the less vulnerable sub-surface injection and semi-subsurface injection systems for applications, where there is sufficient water pressure available for their use.

In sub-surface systems, the foam is introduced close to the bottom of a tank through a separate foam line. It then floats to the surface to spread and extinguish the fire. However, this technique is not used on petrol blends that contain alcohol or other polar solvent additives as oxygenates, because polar solvents destroy the foam, even where alcohol-resistant concentrates are used. The semi-subsurface injection technique overcomes this problem. It can be used for all types of fuel and has all of the benefits of sub-surface injection. The technique uses a flexible hose filled with foam



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under pressure. When the system is activated, the hose floats from the bottom of the tank to deliver the foam to the surface.

Reverting back to the likelihood of a tank rupture following an explosion, it is critically important to provide a bund area that is also is adequately protected. Even for larger bund areas

There are several methods of proportioning, but fixed foam systems typically use what is known as balanced pressure proportioning for inducing the foam concentrate into the feed water line. It got this name because the foam concentrate pressure is balanced with the water pressure at the proportioner inlets.

in major tank farms, fixed low or medium-expansion generators can be used to create an effective foam blanket. Any remaining fuel in the tank can be protected using a monitor. Monitors can be used to protect the bund area, but this leads to much higher foam consumption, and the recommendation is for at least two monitors to protect larger bunds to ensure complete coverage and the effectiveness of the equipment in all wind conditions.

Proportioning Equipment

Put in its simplest form, the proportioning of the foam occurs when foam concentrate is mixed with a flowing stream of water to create a foam solution. This is mixed with air – the term normally used is aspirated – to produce foam that is a stable mass of tiny, air-filled bubbles with a lower density than oil, petrol or water, allowing it to easily flow over the surface of the fire's fuel.

There are several methods of proportioning, but fixed foam systems typically use what is known as balanced pressure proportioning for inducing the foam concentrate into the feed water line. It got this name because the foam concentrate pressure is balanced with the water pressure at the proportioner inlets. This allows the proper amount of foam concentrate to be metered into the water stream over a wide range of flow rates and pressures. Because balanced pressure proportioning equipment is capable of continuously generating large volumes of foam, these systems are a popular choice when protecting tank farms.

There are two main types of balanced pressure proportioning equipment. One type is used in foam pump systems; the other is used in conjunction with bladder tanks. Both provide accurate foam delivery to fire monitors and deluge systems.

The current generation of low-pressure-drop balanced pressure proportioners for foam pump systems come in a number of wide-flow designs. The wide-flow proportioner has an orifice, the area

of which changes in relation to the flow, ensuring the correct proportioning within a wide range of flows. Typically, capacities span from as low as 100 litres a minute to around 40,000 litres a minute.

Bladder tank proportioners also come in a number of design and performance options. They are a solution worth considering when upgrading an existing water sprinkler system to a foam/water system. They are available either as a horizontal tank or as a vertical tank, although vertical tanks do tend to have lower maximum capacities.

Fire Monitors

The reality, as storage tank fires are, thankfully, rare is that fire monitors spend the vast majority of their lives motionless and inert. However, when fire strikes, they can be easily all that stands between recovery and complete corporate and environmental disaster.

In essence, there are two types of fire monitor. The first type is the fixed monitor. As the name implies, this is a static piece of equipment that is attached permanently to pipework and is carefully positioned to stand guard over a specific fire risk. The second type of monitor is the mobile monitor, which is most often used to protect a number of fire risks. They are the "commandos"; ready to be moved anywhere they are needed.

As the terms "mobile" implies, they are trailer mounted for fast deployment around the site so they do require a water supply, which is usually provided by hose connection to a hydrant or portable pumps.

Choosing between fixed monitors or mobile equipment is not straightforward as it may appear. Undeniably, a fixed monitor has the potential to be brought into action on a particular fire risk much faster than a mobile unit that has to be moved, connected to a water supply, aimed and activated.

So, choosing between fixed monitors or mobile equipment is not straightforward as it may appear. Undeniably, a fixed monitor has the potential to be brought into action on a particular fire risk much faster than a mobile unit that has to be moved, connected to a water supply, aimed and activated. However, the explosion referred to earlier has the very real potential to disable or destroy the fixed equipment before it has had any chance of extinguishing the blaze. So depending solely on fixed monitors may be a high risk strategy.

Conversely, reliance on mobile monitors inevitably means some delay before firefighting can commence. It is also imperative that all of the site's possible fire scenarios are carefully assessed so that this delay is not extended while, for example,

the most effective positioning of the monitors is determined. This requires careful fire planning to take into account the throw characteristics of the monitors, the proximity of hydrants, the need for hoses or pumps and possible wind conditions. Planning, therefore, is not an option – it is essential.

Frequently, the best solution adopted for tank protection is a combination of fixed and portable monitors. The fixed monitors act as the first line of defence, while portable monitors are used to protect bunds, deal with fuel spillages and vapour concentrations, and cool adjacent fire risks.

Monitors can be operated either manually by the firefighter or be remotely controlled. Remotely controlled monitors enable the firefighter to operate the equipment at a safe distance from the fire, moving the monitor in both the horizontal and vertical planes and, on the most sophisticated units on the market, adjusting the flow, stream pattern and throw.

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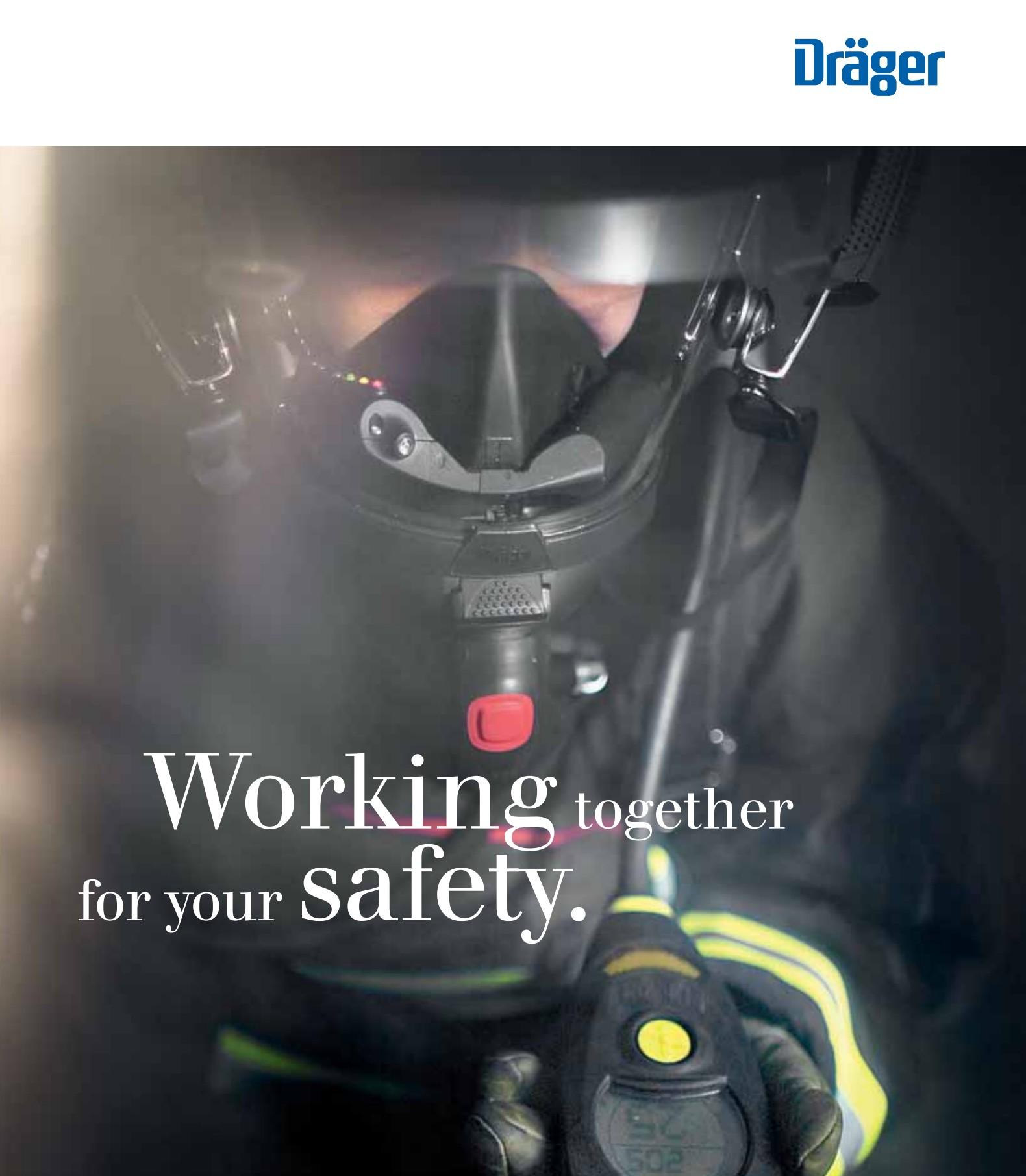
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Spending Less and Getting More From Your Hazmat Suit

Explaining NFPA 1994 and NFPA 1992 and – the certifications of Level B style suits

While the unexpected is expected in the emergency services world, there are two truths: no two situations are the same; and never take any situation lightly.

On any given day a hazmat unit can be called into action in potentially harmful conditions, risking exposure to toxic chemicals, poisonous gases, and deadly biological agents. As such, hazmat professionals rely on their hazmat suits to protect them so they can perform confidently and without worrying about coming into contact with these dangerous elements. Since no two situations are the same, it is crucial to know exactly what the capabilities of a suit is protection are.

The National Fire Protection Association (NFPA) concerns itself with the unexpected, and has created hazmat suit standards so that those who use the products know exactly how different ones are designed to keep them safe in the hot-zone. The NFPA is the leading authority on fire protection and safety, and being certified to its standards is considered the pinnacle of hazmat safety.

Although NFPA standards exist for benefit of the users, they are often used by manufacturers for development of hazmat suits as well. There are several different categories of hazmat suits – for example, Level A for maximum respiratory and skin protection and Level B for maximum

respiratory and lesser skin protection – which correspond with these standards, bringing options to the user.

Since not all situations require extreme protection against the unknown, Level B suits can offer a lower cost option for use in scenarios with known hazards; departments can save money by avoiding use of a significantly more expensive Level A suit when it is not needed. In the case of Level B protective equipment, there are two NFPA standards that a user should look for: NFPA 1994 Class 2 (Protective Ensembles for First Responders to CBRN Terrorism Incidents) and NFPA 1992 (Liquid Splash-Protective Clothing for Hazardous Materials Emergencies). These standards ensure that a user will be protected in a wide range of situations.

In today's economy, cutting back on expenses and settling for less is commonplace, but it has no place in the emergency service industry. Just because a Level B suit can be selected to save money, it does not mean users must compromise on the level of necessary protection. A Level B suit, dual-certified to NFPA 1994 Class 2 and NFPA 1992 is the best option for the best price, and offers an enhanced level of protection for many different scenarios.

This article details the NFPA 1994 Class 2 and NFPA 1992 standards to provide a better understanding of what one gets when using Level B equipment certified to these standards, along with some of the options that are associated with them

NFPA

NFPA standards can be traced back to the late 19th century with the development of automatic sprinklers. According to the NFPA, when automatic sprinklers were first introduced they worked well as extinguishing devices when properly installed. However, installation methods and practices varied widely, hampering their reliability. The solution was to create a centralised set of universal rules for sprinkler installation, so that civilians and firefighters were safe no matter the situation.

NFPA standards represent the highest protection for hazmat suits because of the strict requirements products must follow in order to become compliant. When a hazmat suit is certified to one of the many NFPA standards, it means that it has gone through hundreds of performance tests following a set of guidelines that have been developed from more than a century of research and experience in the field.



Not all hazmat suits on the market are created to NFPA standards. But like the poorly installed automatic sprinklers, who would want to rely on something that might not be installed properly, or in the suit's case, one that might not provide needed protection in the most dangerous scenarios?

NFPA 1992

When performing in the hot-zone, it is important to be focused on the mission at hand, not the suit's protection level. NFPA 1992 is one of the lesser utilised standards, as many hazmat teams concern themselves with vapour-capable protection when responding to spills. However, it is beneficial to look for certified NFPA 1992 protection if your department is concerned with liquid chemical exposure.

NFPA 1992 establishes the requirement for chemical liquid splash protection when no chemical vapour hazards exist. To be certified to NFPA 1992, the suit goes through rigorous tests to ascertain if it will stay intact and work properly when put in action. Suit material and seams are tested for chemical permeation against seven different chemicals, and only passes if the rate of permeation does not exceed the maximum allowable amount within an hour.

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NFPA 1992 is not limited to hazmat suits. The same tests are performed to ensure that gloves and footwear are protected from liquid-splash exposure. Gloves and footwear are also tested for impact and compression resistance, putting them through the same puncture, abrasion, and cold weather tests. On top of that, footwear is also tested for bending resistance and slip resistance.

NFPA 1992 is designed to protect the user against liquid chemical splash, but does not ensure protection from gaseous chemicals; this can be observed through its typical configuration, which is an open faced coverall having a loose fitting bungee style interface to the SCBA mask and bottle on the back. While this design provides essential protection against liquid splashes, the user is vulnerable to airborne hazards if the suit is certified to NFPA 1992 only.

NFPA 1994 Class 2

The NFPA 1994 standard defines design, testing and performance requirements for protective garments used by first responders in a terrorist incident involving chemical, biological dangers. There were originally four classes of protection defined with this standard, but in the most recent edition (2007) Class 1 was removed and incorporated into the NFPA 1991 standard (Vapour Protective Ensembles for Hazardous Materials Emergencies). As a result, Class 2 became the highest level of protection within the NFPA 1994 standard.

NFPA 1992 is designed to protect the user against liquid chemical splash, but does not ensure protection from gaseous chemicals; this can be observed through its typical configuration, which is an open faced coverall having a loose fitting bungee style interface to the SCBA mask and bottle on the back.

A suit that is certified to the NFPA 1994 Class 2 standard is used when the agent or threat has been identified and the actual release has subsided. Similar to NFPA 1992 ensembles, NFPA 1994 Class 2 protects responders from direct contact with liquid chemicals. However, unlike NFPA 1992 ensembles, a suit certified to NFPA 1994 is tested for protection against gaseous chemicals.

NFPA 1994 protective garments are similar in configuration to NFPA 1992. However, NFPA 1994 Class 2 has the option to be configured as a fully-encapsulated suit with the SCBA and mask on the inside of the hood. In this way, 1994 Class 2 is similar to the design of NFPA 1991 configured suits.

When a suit is certified to both NFPA standards, it enhances the suit's usability because it is acceptable in more situations and will offer more protection than ones that only offer a single certification, not to mention requires less storage space, logistics, and training associated with the management of two separate products.

Dual Certification

As can be seen by the test requirements, the NFPA 1994 Class 2 and NFPA 1992 standards are very similar in nature. Both ensure users that they will

be protected from chemical contact, address physical properties of the materials, and are used in similar situations. However, it has been a common practice for Level B hazmat suits to only feature the liquid splash protection offered by NFPA 1992, or even no certification at all. This leaves a severe gap in the protection level of the suit: high-level skin protection, mostly due to the decision to save a few dollars.

Believe it or not, many hazmat professionals who inappropriately use these suits create a false sense of security by applying tape to critical areas for sealing mask-suit and glove-suit interfaces. Users commonly wrap duct tape around them to block obvious chemical passageways. This goes against the standardised protection that NFPA stands for.

Thankfully, there are now some suits on the market that offer certification to both standards. This offers a suit to use in situations that do not require a Level A suit, but also one that provides the liquid splash and gas chemical protection. These suits take those two universal truths very seriously and make sure users are protected no matter what.

The suits that offer dual certification, like Saint Gobain's ONEsuit Shield, feature a tightly sealed mask interface using a gasket to connect the mask to the hood. The rim of the mask fits flush against a rubber lining that is built into the suit's hood, stopping gases from flowing into the suit. Not only does this improve the suit's ability to protect the

user, but it also gives the user more visibility and a greater range of motion.

Conclusion

No two situations are the same, and never approach a situation lightly. These two universal truths have shaped the capabilities of hazmat teams and engineering of hazmat technology. The NFPA has taken this mantra and created standards so emergency personnel do not need to concern themselves with anything other than the task at hand.

The extensive tests performed to receive certification to NFPA standards ensure hazmat professionals that their protection is not being taken lightly. And although no two situations are the same, using equipment certified to NFPA standards enables standardised use throughout the hazmat industry.

With that being said, it is imperative for hazmat teams to understand the requirements of these standards. This not only determines your safety during use, but also gives peace of mind while in the hot-zone because the suit's capabilities and protection levels are aligned through training in advance of any response.

Peter A. Kirk is Market Manager at Saint-Gobain Performance Plastics

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Equipment Developments in USAR



Ian Dunbar

Holmatro

The physical and emotional burden on USAR personnel deployed anywhere in the world is enormous. For this reason alone, the equipment they choose must perform in the toughest of environments.

So far the 21st century has witnessed global devastation on a scale not seen in living memory. Indeed the century was not even a month old, when there was massive destruction due to the Gujarat earthquake in India and then of course, came 9/11. On Boxing Day 2004, a 9.1 magnitude earthquake off the west coast of Sumatra, Indonesia led to a tsunami, which affected 14 countries. In October 2005, the Kashmir region of India was hit by a quake. Haiti was devastated by an earthquake that hit the island in January 2010 and in 2011 we have also seen New Zealand and Japan hit. Approximately one hour after the Japan earthquake, a tsunami hit the island (and affected the wider Pacific region).

This series of high profile natural disasters, and other man made events, are a stark reminder, if it were needed, that urban search and rescue (USAR) personnel need to be better prepared than ever before and have the latest equipment to allow them to perform with maximum safety and success, in these areas of devastation. It also serves

to remind us that USAR is no longer just confined to rescue from collapsed structures. Due to the types of disasters we have seen, USAR teams also have to be proficient in, and have the tools for rescue from all types of vehicles and public transport. Following a tsunami, they have to be prepared for the rescue of persons who could be found in any location.

Rescue Tools

All USAR operations require specialist tools. Manufacturers of hydraulic rescue equipment have worked closely with rescuers to ensure that the advances in recent years allow teams to operate more safely and more effectively. The ability for teams to work with well-designed, ergonomic and intelligent equipment means that casualties stand a better chance of being located sooner, medically stabilised and extricated more quickly, which greatly increases the chances of survival.

There have been many advances in all types of rescue equipment designed for USAR operations.



These changes have come in the form of specifically designed cutters, for the cutting of chain, padlocks and rebar (reinforced steel found in masonry and concrete as a tensioning device). These are small and can be operated by one hand and powered by small, mobile pumps, light enough to be taken over challenging terrain.

Tools that are designed specifically for crushing concrete give crews an alternative to the practice of sawing. This type of tool is silent in operation and creates far less dust during operations, which improves the environment for rescue personnel and casualties alike. Hand-controlled hydraulic cutters and "combi" tools (combination of spreading and cutting) are silent in operation, making the scene safer due to improved communication. Less noise also means the increased ability to locate casualties, maintain contact and perform remote medical assessments far more effectively.

Rescuers now have more options when it comes to lifting. Hydraulic wedges allow lifting operations to commence in narrow openings (from an initial height of 6mm). These wedges can be hand controlled or powered by a pump. The initial use of the hydraulic wedge can be followed up by high pressure airbags, toe jacks and hydraulic cylinders.

The success of change under flow type couplings for specialist cutters and wedges mean that the rescuer can have hoses extended to the scene of operations and change tools independently. This increases the capability of the rescuer in terms of using existing hydraulic tools for USAR operations.

Self-contained tools, whether hand or battery operated, are invaluable for use in urban search and rescue. Not only are they versatile enough to deal with a wide variety of materials, they are also light and easily portable. Hand operated tools are ideal for work in confined spaces, producing no noise or emissions. Battery operated tools, with their small dimensions, are ideal for use on smaller police, fire, ambulance and rescue vehicles. They are also ideal for use on rescue helicopters where weight limits are very important.

Challenging Environments

It must be remembered that the geographical locations where USAR teams have to work vary greatly, making logistics difficult at best and nearly impossible at worst. The New Zealand earthquake for instance saw teams located in Christchurch, a

large modern city with well-developed infrastructure (albeit affected by the earthquake). Rescuers in Japan however faced a very different situation in terms of gaining access for personnel and equipment. The nature of the Japanese tsunami meant that the infrastructure that did exist, was simply washed away making the availability of light, self-contained tools, a logistical advantage.

Buildings vary greatly all across the world. Their design, the materials used and the methods of construction employed, all mean that there can be no standard approach to urban search and rescue. It therefore follows that next to specialist equipment, USAR teams also need rescue tools versatile enough to deal with the many types of materials that will be encountered. It should also be remembered that rescue from a collapsed structure means not only penetrating the building materials, but also the contents of the structure, whether that is furniture, fittings, fabrics or indeed vehicles.

Advances in casualty detection (seismic/acoustic listening devices, canines) mean that casualties are being located at greater depths than ever before, both horizontally or vertically. This presents problems in terms of maintaining safe access and egress due to the need to stabilize debris. Because of this, emergency shoring is now becoming more complex and intelligent systems are invaluable. They must be light, readily deployable and provide structural support in a whole host of situations where various heights and spans are required. They must also have options in terms of method of operation being manual, pneumatic or hydraulic. A great advantage is for your shoring system to have a capacity to lift.

Conclusion

The work of urban search and rescue specialists is difficult enough, but we must also remember that all of the devastation we have witnessed throughout the first decade of the 21st century has coincided with the rapid growth of instant media. Twenty-four hour rolling news and smart phones mean that disasters are now reported on virtually as they happen and witnessed on a global scale, adding to the pressure and increasing the expectancy on rescuers.

The challenge for USAR teams is to constantly maintain and increase skills and knowledge, while all the time ensuring they have the latest tools and techniques to deal with the catastrophic scenes already witnessed this century.

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Ian Dunbar is the Rescue Consultant at Holmatro

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Michael C. Ruthy

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In a perfect world, Plan A works, and the sprinkler system puts out the fire. Before I am accused of blowing this out of proportion, this does work in the vast majority of emergencies. But sometimes it does not, especially in construction projects where such systems may not be fully operational, and the Shanghai Fire Department wanted to be prepared. In the words of our metallurgist, Robert Allen, "A test is worth a thousand expert opinions." The problem is that tests are hard to come by.

Shanghai has many high rise construction projects, some in excess of 100 stories. Such buildings are becoming more commonplace, while even taller ones are being built around the world. The Shanghai construction company worked with us to conduct studies that cannot usually be done once a building is in operation.

During the construction of this building, a structure with an approximate height of 250 meters, we were allowed to conduct tests to verify the response ability in extreme conditions. I am arbitrarily defining 'extreme' as anything over the 14th floor. That is a rule of thumb I have heard.

In the United States, automotive vehicles with pumps are generally rated up to 250 psi (~17 bar), according to the standard published by the National Fire Protection Agency (NFPA 1901). This pressure will allow flows to approximately 178 meters, with no pressure remaining and no allowance for friction loss. If you allow 100 psi

(7 bar) for a usable nozzle pressure, an NFPA 1901 pump can push water up 150 psi (10 bar), or about 100 metres and still have workable pressures. Thirty stories at best.

So when the unthinkable happens, and fires rage uncontrolled at stories far above our range of reaction, what do we do? It starts with homework.

Fire districts should assess their areas and plan for the unthinkable. It is not pretty, but first we reviewed some recent history. The Philadelphia fire at One Meridian Plaza was a teaching experience. My colleague, Robert Tutterow, has some excellent articles on some of the difficulties of fighting fires in high rise structures that I would urge you to check out.

The tests we performed involved specialised equipment and custom built apparatus. Not all departments are equipped to do what Shanghai did, nor do they need to, though new response ideas are evolving.

Compressed air foam is a concept I have been voicing since it was developed. Our calculations indicated a usable stream on the top floor with only 175 psi at ground level. Compressed air foam bubbles are lighter than water, and regular rules of thumb do not apply due to that. While compressed air foam bubbles are lighter and contain less water, the fact that one could move any water to such a height would be significant. The Shanghai Fire Department, while familiar with



compressed air foam, did not want to rely solely on it for their pumping requirements. They wanted to move water to such a height – plain water – in case the compressed air foam system failed in some way. This required special equipment.

We built the test truck with these operational requirements in mind. In order to pump water this high, the pump would need to produce 600 psi, or about 42 bar. In order to minimise friction losses at reasonable flow rates, a special 75mm hose was located that could operate at these high pressures. Once charged to 100 stories, the water column of such a deployment exerts tremendous pressure at ground level, even when operations are ceased. Draining the hose lines is a serious safety concern.

To prepare for this situation, Darley, Darley China, and the Shanghai Fire Department worked together to utilise a special wye valve that could operate at the required operating pressures (42 bar) and provide for a means to drain these lines without danger to the firefighters or to the equipment.

The discharge hose was deployed vertically up the outside of the structure to its top floor, with special precautions taken to ensure no connections would come loose. A loose 75mm hose discharging at 42 bar could pose serious risks, and even supporting the hose was a concern. 75mm NH connections were used as similarly sized Stortz connections were not available in the pressure range required.

A two-stage pump was employed to deliver the high pressure at reasonable engine speeds. Once everything was deployed, the pump was started up, and within minutes, two nozzles were discharging at the top floor. The result was a success in that it proved 'Proof of Concept', though all admit in an actual fire scene, such a deployment could prove difficult. Access to the upper floors may be compromised, and having the proper equipment available to attempt such a knock down would be an obvious issue. Deployment of this equipment would require significant manpower and time, during which the fire could escalate. That said, being able to do so, even in a controlled environment, gave the Shanghai Fire Department encouragement that they had a tested way to attack such fires.

There are other means available to jurisdictions that may need to respond to such fires, though

again, I must stress the importance of being prepared. Such resources must be identified ahead of time and plans developed for how they might be used. One such system is an almost unbelievable concept: The Helicopter Pumper.

This concept is not new, and is actually being sold in several countries. As radical as it sounds, a helicopter equipped with about 2,500 litres of water and an engine driven pump, in this case an aircraft quality Rotax engine with 64 HP (50kW), can present amazing firefighting capabilities and is proven technology. Helicopters can rise far further than fire departments can pump, and can direct the water stream into the building with more flexibility and speed than a deployed line can allow. Our OEM customer, Kanrus Co. in Kansas, USA, is specialised in this type of response, for both high rise applications and forestry needs, among others. Several videos on the internet are available to gain some familiarity in how these systems might be used. There is a lot of potential to their approach.

Finally, I would like to draw attention to a class of new products that are currently coming available to the market: drone or remote controlled surveillance aircraft. Such equipment was available for demonstration at last year's fire show in Leipzig (Interschutz 2010) and has been increasing in capabilities ever since.

Several manufacturers now make such devices. Some of these are adaptations of toys, which I could not recommend. Some devices are highly engineered specifically for the fire service and could suit multiple purposes.

Most consist of a small remote helicopter design, perhaps one-meter in diameter, which can relay fire ground information back to the command post in real time. Many are equipped with sophisticated instrumentation and capabilities. A drone helicopter can fly to any story of a high rise building, and with infra-red cameras, determine which floors are in danger. Similarly, it could improve rescue efforts for lost hikers in a forest. The type we have shown can be equipped with not only HD live video, but thermal imaging, radiation and hazmat detection, and a host of other features. Many manufacturers offer products like these, with various levels of sophistication to suit a department's needs.

With built in stability control (units will maintain their location, through GPS, within about a one-meter radius, unattended), 'come home' capabilities (one touch return or a 'low battery' signal flies it back the operator the way it came), and a viewing eyepiece to direct flight and observation with only a turn of the operator's head, I predict these will become indispensable tools for firefighting in many applications. We have demonstrated distances as far as five kilometres and heights beyond the tallest skyscraper yet to be built. It might not be able to fight the fire, but knowing where the fire lies is information to be used.

The world is getting taller. Cities are getting taller. Physics is not changing, though how we fight fires is. We need to adapt our response procedures for the new conditions confronting us. Fortunately, we have solutions available that would have been ludicrous even a decade ago. Jurisdictions with high rise buildings have new tools with which to prepare for the unthinkable. After looking at what Shanghai has done, preparation is the key tool.

Michael C. Rathy is Vice President of Engineering at WS Darley Company's Pump Division

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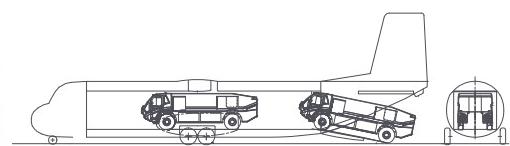


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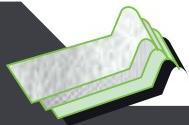
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Command and communicate

Fire and rescue command and communication vehicles come in an ever increasing number of shapes, sizes and configurations, reflecting the trend of tailoring each vehicle to the particular user's precise needs.

Kevin Brandes

Mobile command and communications vehicles play a critical role with specialised emergency response teams to manage, organise and monitor incidents – such as major fires and natural disasters – over long periods of time. These mobile command centres often include radio and video equipment, space for personnel and conference rooms, as well as storage areas for equipment. Fire departments, law enforcement departments, and other governmental agencies are typical customers for this type of vehicle.

The most significant trend in this market may have more to do with the customer than with the accelerating changes in technology. Today, customers are much more in tune with what they need," says Bill Proft, senior chief engineer and market manager for Pierce Manufacturing of Appleton, Wisconsin, USA. "They understand the technology a lot better than they did even a few years ago, and they know what their needs are. Customers are coming to us a lot more educated about the technologies and the capabilities they want in their mobile command vehicle."

Mobile Command Capabilities

A mobile command and communications vehicle is designed to serve a wide range of requirements, and may contain the following types of features and technologies:

- The latest radio, video, surveillance, and communications systems to help emergency response leaders manage any emergency.
- Command and communications equipment that is organised for optimal use. This equipment should be stored in easily accessible areas, such as above command workstations.

- Slide-out command areas that contain room for personnel, equipment storage and conference rooms. These slide-out rooms can greatly increase interior space for meetings and conferences.
- Exterior-facing video and communications equipment for incident command meetings that are built into the body and shielded from the elements with a well-insulated compartment door.
- Telescopic light, weather, and surveillance equipment with the ability to pull in vital data while illuminating an emergency scene for long periods of time.
- Interiors that are designed to maximise flexibility.

Types of Vehicles

Mobile command vehicles are built on a wide selection of custom or commercial chassis types and sizes to accommodate a range of customer requirements. These include everything from small commercial to large custom chassis, giving customers the flexibility to design a vehicle that fits its unique requirements and available budget. "We build command vehicle with bodies that run from 4.3 metres to 10.4 metres long, and everything in between," states Proft. "Some departments and agencies don't need to carry 12 people and lots of equipment on board, so a more compact vehicle is the correct choice. And with today's electronics, you can fit a lot of componentry into a relatively small space."

A wide range of emergency vehicle types can incorporate mobile command capability functions. "Other types of emergency vehicles, such as HazMat apparatus, may have an area inside the

body or cab that accommodates a small laboratory, as well as a space that features a computer network and an external video camera to help monitor a scene," says Proft. "In fact, you can include those capabilities on any custom rescue vehicle – with a small command area in the crew cab with, for example, weather monitoring and video capabilities."

When it comes to engineering and building mobile command units, Pierce often works together with sister company, Frontline Communications of Clearwater, Florida. "When a sales representative submits a mobile command vehicle specification to our team, we determine the optimal building process based, in part, on the electronics requirements," states Proft. "If the customer's requirements include sophisticated communications electronics – such as connecting radios, cell phones, satellite phones, and other components – we call on Frontline's expertise. They design many integrated mobile communications systems. Frontline operates exclusively in that domain, and has tremendous expertise because of its work in engineering sophisticated, mobile television network broadcast vehicles. When we collaborate with Frontline Communications, it is a powerful combination."

Listening and Staying on the Cutting Edge

The engineering and building process for a custom vehicle manufacturer should begin with finding out as much as possible about the customer's needs. "It is primarily a matter of listening to what the customer wants to do," says Proft. "A manufacturer needs to understand the requirements, and have a process in place to bring it together in a vehicle. That is the approach we take with everything on the truck. Not just the electronics, but also the cab, body and chassis. 'How are you going to use this truck?' 'What do you need to carry in the vehicle?' 'How many people need to be inside, and how do they interface with one another?' All these play a role in what type of vehicle will do the best possible job. We have many different products, and we can configure one to meet a customer's specific requirements. It is not always easy but, if you are a true custom builder, that is what you need to do."

With the explosion of new technologies, vehicle manufacturers need to focus resources on how to integrate these new products into their offerings. "We help our customers stay abreast of new capabilities," Proft explains. "The technologies continue to improve, such as video cameras and high definition electronics. And we have a person whose responsibilities include sourcing and managing the development of these new products and accessories. He is constantly searching for new technologies, and works together with our colleagues at Frontline to make them available to our customers."

A Gentle Reminder about the Suspension

With expensive and sensitive electronics on board, a vehicle manufacturer needs to focus a lot of energy on the chassis and suspension that often carry these capabilities into rough and/or off-road conditions. Available chassis technologies, such as Pierce's TAK-4 independent front suspension,

provide a smoother ride for personnel and sensitive electronics. "With command centres, independent front suspension is a definite plus," says Proft. "It gives a far better ride quality than a straight axle suspension. It also offers other significant benefits, such as a shorter stopping distance."

An independent front suspension also gives the vehicle an increased weight carrying capability. "Departments sometimes tend to specify a too light or too heavy axle on the front and rear end," says Proft. "It is very important to incorporate axles that are properly sized for the application. There are cases where, for example, you have a heavier stainless steel body and carry lots of equipment on board. In these cases, the more capable independent front suspension is a big plus."

The rear suspension components receive an equal measure of attention. "We always recommend an air ride suspension on the rear as it will help cushion the sensitive equipment," states Proft. "If you are carrying \$200,000 worth of electronics on the vehicle, the last thing you want to do is bump and jar it going down the road or maneuvering off-road in an emergency. A stiff suspension may be too much, and you have to look at weight balance and make sure you are not over sprung or under sprung on both axles."

Example at Work: Frisco Command Vehicle

Pierce recently built a custom command centre vehicle for the Frisco, Texas Fire Department located directly north of Dallas, Texas. This vehicle is possibly the most advanced mobile command centre the company has ever produced.

Among its many technologies, the apparatus is equipped with highly advanced video streaming capabilities. The system enables the mobile command centre to receive live streaming video feeds from any of the security cameras located within the city's 36 schools. This capability allows first responders access to live video from inside schools and the ability to share this footage with the department's Emergency Operations Centre and all first responders.



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The same live streaming video capability is available through feeds from all 200 of the city's "pan-tilt-zoom" traffic monitoring cameras. This enables the department to pinpoint and assess storm damage or other emergency information more quickly and accurately to provide citizens with a new level of service and support.

The vehicle is built on the Pierce Velocity chassis with TAK-4 independent front suspension, 450-hp engine, and a 62,800 GVW rating. Other features and capabilities include a 10.5-metre long (2.23-metre interior walkway height) aluminium walk-in command body with three slide-out modules for additional room inside when deployed at an emergency scene. The vehicle has a conference room with six workstations – two with full dispatch capabilities. Total interior floor space with slide-out rooms extended is more than 30 square metres.

On board communications equipment includes a video teleconferencing system and an 800 digital radio system to provide interoperable communications among all responders. The unit has 20 video display screens throughout the apparatus, including a one-metre screen mounted outside the vehicle for incident team briefings.

Imaging equipment on the vehicle includes portable thermal imaging camera receivers, a mast-mounted thermal imaging camera and mast mounted High Definition (HD) camera to quickly assess emergency situations.

Example at Work: Northern Illinois

The Northern Illinois Police Alarm System (NIPAS) is a joint venture of suburban municipal police departments surrounding the Chicago metropolitan area. NIPAS offers services that the individual departments cannot alone afford to provide their respective communities.

The Pierce command vehicle is deployed to incidents such as search warrants, hostage situations, large-scale events and even dignitary protection. The vehicle is typically deployed with a single driver who drives the vehicle from its central location to carry all of the required gear to the scene.

What is on board is an impressive list of capabilities designed to make NIPAS more effective and efficient. Behind the driver is a command

area, which has six radios and all the frequencies from the 65 active NIPAS communities and statewide interoperability frequencies. The unit has the capability to become a secondary command post in the event the team has multiple simultaneous emergencies occurring.

Once on a scene, the vehicle has a dedicated area for interviewing people that are involved with the situation – a place for the agency's negotiations personnel to speak to them in a controlled environment. As a support unit for the Emergency Services Team, the vehicle needs to carry a wide array of equipment, including ballistic shields of every kind and a wide assortment of lighting equipment to meet specialised needs. The vehicle is designed to allow teams to work more effectively and safely, and has additional compartment space to accommodate future equipment needs.

Example at Work: North Hudson Regional Fire & Rescue

North Hudson Regional Fire & Rescue serves the citizens of North Bergen, Union City, Weehawken, West New York and Guttenburg, New Jersey. This region, situated directly across the Hudson River from New York City, is the most densely populated area in the United States, with high rise buildings, bridges, the Lincoln Tunnel, light rail lines, railroads, industrial and commercial structures, shopping centres, congested highways and hazardous materials storage.

North Hudson Regional Fire & Rescue recently purchased a Pierce mobile command vehicle to support its fire suppression, rescue services, marine division and HazMat services teams. The vehicle is built on a commercial chassis and features a compact 5.5-metre body. The unit includes 1.9 metres of interior walkway height, a conference area, four workstations, computer network, six line telephone network, satellite system, audio/video system with LCD monitor and 4-channel DVR, electronics rack, exterior awning and a light tower.

As these examples demonstrate, the capabilities of today's mobile command vehicles are quite extraordinary. And as technology evolves and the services that first responders undertake expand, so too will the capabilities of mobile command vehicles. **IFF**

Kevin Brandes is a U.S.-based technical editor specialising in fire and emergency products and technologies

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Tales of Risk and Heroism



Geoff Trickey

Psychological
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Risk management practices cannot be fully effective when they are solely preoccupied with procedures, while ignoring the risk taking nature of the individuals involved.

Naturally enough, King Stefan and Queen Leah were horrified when the baby Princess Aurora (alias 'Sleeping Beauty'), was cursed by Maleficent. On her 16th birthday, Aurora would die after pricking her finger on a spinning wheel spindle, what should they do? Clearly the ideal solution might have been to deal with Maleficent and her like and put an end to cursing all together. However, since Maleficent had the powers of a wicked witch, we have to excuse Stefan for opting for the regulatory route and for dealing with the threatening object rather than with the complexities and uncertainties of the individual. All spinning wheels in the kingdom were duly burned!

In the real world we face risks of all kinds that we would like to mitigate, but here is the dilemma; like the fabled spinning wheel, every day objects like iron frying pans, pointy sticks and even a frozen legs of lamb (according to Roald Dahl) are all potentially dangerous or even deadly weapons. Whether or not there is actually any risk involved depends entirely on whose hands these potential weapons are in.

The trends and outcomes in modern risk management appear surprisingly similar to those in Sleeping Beauty. In attempting to eliminate risk, the human factor is left languishing in the 'too difficult basket', becoming marginalised by a preference for procedural solutions; rulebooks, checklists, regulation of all kinds and a labyrinth of legislation. This is not of course because human factors are daunting in the Maleficent sense, but they are daunting in their complexity and their

obscurity. We have been at a loss to know how to get to grips with the human risk factors, but recent research into personality and Risk Type is making an important contribution.

Financial events provide their own modern morality tale as the total failure of all safeguards against excessive risk lead to the near disintegration of the world economy. Terms like 'toxic debt', 'rogue banker' and 'Frankenstein bonds' have made it from the financial and business pages into the tabloids and into our daily lives. Risk taking is, of course, at the very core of the problem. However, even though the perpetrators of financial chaos are easily identifiable, we don't tend to ask 'what is it about these people that allowed them to do it?' 'What human chemistry was responsible for such delusions of indestructibility?' 'How did the once staid and sober bankers turn into greed driven Geckos of Wall Street?'

And what is going on in the emergency services? Angry headlines following the 2005 London bombings highlighted the delay in firefighters reaching the trapped and dying victims deep underground, leaving shocked and wounded passengers to help each other. In 2007, an inquest heard how police community support officers stood by while a ten-year-old boy drowned in a pond in Wigan in the UK. Senior officers with the Greater Manchester force, which employed them, said they acted "correctly", citing health and safety restrictions by way of explanation.

In another incident a volunteer coast guard saved the life of a 13 year old who had fallen onto

a cliff ledge in gale force winds. In spite of his courage and initiative he was criticised for breeching Health and Safety regulations and 'under immense pressure' resigned his post. And, more recently, a 51-year-old village post woman of 21 years service was suspended from duty after clinging to the bonnet of her van in a 'courageous' bid to stop a thief driving off with the mail. She has been threatened with the sack.

Meanwhile, the UK public has been as prominent as ever on the front line. One headline reads, "Hero students leap into river to save drowning woman as police officers refuse to help". Check out too the extraordinary and unforgettable YouTube video clip of pensioner Ann Timson (dubbed Supernan) tackling six armed raiders with her swinging handbag and driving them off empty handed.

The question is whether, in our management of health and safety, we may increasingly be trying to pursue opposing and incompatible objectives within the emergency services and in relation to public expectations?

Of course, these accounts of over cautious emergency services, of heroes facing dismissal and of the general public taking on the criminals all have the same underlying theme; the spontaneous impulse of people to come to the assistance of others in peril with absolute conviction and without concern for their own safety. Many others, of course, would have cowered or run for it – but that is the simple reality about the diversity of responses to risk across the spectrum of human nature.

The contrast between have-a-go members of the public and the procedural approach of emergency services looks like a fundamental disconnect in the fabric of modern life. Both heroism and Health and Safety are concerned with the protection or rescue of those under threat or in distress. The question raised by the above examples is whether, in our management of health and safety, we may increasingly be trying to pursue opposing and incompatible objectives within the emergency services and in relation to public expectations? In short, is the Health and Safety approach being taken to counterproductive extremes? Some clearly believe it is.

In the children's story 'Wendle's Workshop', an ingenious mouse invents robots and much else. The Wendlebot was designed to tidy the workshop, which it does very effectively, but then it cannot be stopped. By the time it is finally destroyed it has reduced everything in sight to tidy piles of powder or useless fragments. It then sets out to tidy the world. Maybe Health and Safety has become a Wendlebot? Having carried out its initial task very well, but now out of control, it persists to create a topsy-turvy world, preoccupied with form filling, box ticking and paralysing risk analysis? Apparently, the present UK government

is concerned. Lord North has been overseeing a review of Health and Safety regulations and the UK Prime Minister recently pledged to free emergency services from senseless health and safety rules.

King Stefan and Queen Leah failed to stop the witch, the emergency services procedures do not stop people being heroic (just parts of the emergency services) and the FSA regulation of the finance sector did not prevent the excesses of the financial meltdown. Human factor risk is a challenge and is hard to get to grips with, but total reliance on procedures and regulations simply doesn't cut it. Heroes will be heroes, chancers will be chancers and the anxious will be fearful. Managers have to manage and leaders have to lead and that means making judgements and decisions and not abdicating that responsibility or hiding behind a fog of spuriously systematic or numeric procedures. Solutions have to work from honourable principles and personal responsibilities. Managers need to know their people, their strengths and their limitations and to train, support and deploy them appropriately.

If this all sounds rather one sided, there clearly is an important place for the regulatory approach. If there is a problem with current practices, it is that regulation has become too influential and an easy way of avoiding real issues about individual differences. The truth about risk is that individuals really are fundamentally different in their propensity for risk. They differ in their Risk Type, in their risk attitudes in their risk tolerance and in the degree to which they expose others to risk. These differences are the problem, in so far as the impulsive, the carefree, the adventurous all push the limits in terms of the risks they are inclined to take and the risks they expose others to, but they are

The truth about risk is that individuals really are fundamentally different in their propensity for risk. They differ in their Risk Type, in their risk attitudes in their risk tolerance and in the degree to which they expose others to risk.

also part of the solution. Any enterprise needs risk takers. They drive business and they drive the economy as well as pushing the frontiers in the arts, sciences and technology. Creativity, entrepreneurship and heroism, all involve taking risks – indeed any investment of time, effort or money involves risk. Risk is as ubiquitous as the air we breathe.

The challenge for managers must be to deploy risk types appropriately, to achieve the appropriate balance of risk types within any group, at the level of the team, the department or the organisation. This has been difficult to achieve because the human risk landscape has been virtually invisible. Look across the room, or out of the window, or across the crowded rush hour train carriage; there

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is a lot to take in terms of individual differences, but zero information about their disposition towards risk. Some will undoubtedly be crazy hot-heads; up for any kind of wacky adventure, others will be so risk averse that they are permanently anxious and fearful and will worry and fret themselves through their working day. These fundamental differences in temperament need to be recognised and harnessed.

Personality research reveals eight Risk Types; types whose underlying temperament establishes a persistent bias towards very different perceptions, expectations and behavioural responses. This kind of analysis has the potential to make the human risk landscape visible; to provide a vocabulary that facilitates planning, research and discussion about human factor risk. These are important steps in getting to grips with human factor risk and towards redressing the balance with the regulatory approach.

In the Sleeping Beauty story, the regulatory strategy; the banning of all spinning wheels, fails to save the heroine but the effects of the curse are moderated by Merryweather, the good fairy, who was able to influence the impact of the wicked witch Maleficent, for our purposes, the personification of human factor risk. Recent and current world events dramatically highlight the potency and potential destructiveness of risk mismanagement. To achieve a Merryweatherian moderating effect, we need to understand and address the human risk factor. A greater understanding of the roots of risk taking in the temperament of the

individual must be of central importance. To succeed we need the capability of making more strategic management decisions about who we rely on for what, which combinations of risk types is optimal for any circumstance and where throughout the organisation the various risk types are currently positioned.

Type Definitions

• Spontaneous

Uninhibited and excitable, this Risk Type enjoys the spontaneity of unplanned decisions. They are attracted to risk like moths to a flame, but are distraught when things go wrong. Their passion and imprudence make them exciting but unpredictable.

• Intense

The Intense Type tends to be highly strung, pessimistic and nervous about any threat to their equilibrium. In extreme examples, personal relationships and decision-making can become an emotional minefield. Passionate and self-critical by nature, they react strongly to disappointment, taking it personally when things don't work out.

• Wary

Self-disciplined and cautious of risk, the Wary Type is organised but unadventurous and puts security at the top of the agenda. They will be drawn to the idea of securing their future but anxious that however well something worked for others, in their case it will go wrong.



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- **Prudent**

Very self-controlled and detailed in their planning, the Prudent Type is organised, systematic, conservative and conforming. Conventional in their approach, they prefer continuity to variety and are most comfortable sticking to what they know.

- **Deliberate**

Self-confident, systematic and compliant, the Deliberate Type tends to be unusually calm and optimistic. They experience little anxiety and tackle risk and uncertainty in a business-like and unemotional way. They never walk into anything unprepared.

- **Composed**

The Composed Type is cool headed, calm and optimistic, but at the extreme may seem almost oblivious to risk and unaware of its effect on others. They take everything confidently in their stride, seem quite imperturbable and manage stress well.

- **Adventurous**

The Adventurous Type is both impulsive and fearless. At the extreme, they combine a deeply constitutional calmness with high impulsivity and a willingness to challenge tradition and convention. Intrepid and never discouraged, they quickly rebound from any setback.

- **Carefree**

Spontaneous and unconventional, the Carefree Type is daring, excitement seeking and sometimes reckless. Not good at detail or careful preparation, they often seem unclear about their objectives. Their impatience and imprudence can lead to hasty and unwise decisions.

- **Typical**

Individuals who show none of the extremes that characterise other Risk Types are classified as 'Typical'. Because they score close to the centre they will not naturally be exceptionally prudent or unusually reckless, neither will they be particularly emotional or extremely calm. Any pronounced risk-taking behaviours will likely be due to attitudes developed from specific experiences.

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Evolution of the High Volume Pump

Johan Kramer

Hytrans Systems

High Volume Pumping, and particularly mobile high volume pumping equipment, has developed tremendously in the past 20 years.

At the end of the 1980s, Hytrans Systems developed a mobile water supply system that was a water transport system without draft problems. The high volume (submersible pump) was called the HydroSub, which basically is a hydraulic-driven submersible pump that is fed via 60 meters of hydraulic hose and a diesel driven power pack. This enables the submersible pump to be hand carried to locations where it is impossible to use standard suction pumps due to the limited length of the suction lines.

Although developed in cooperation with the Dutch Home Office, its main task was providing firefighting water and, as such, the system needed to be mobile and had to be capable of being deployed with a minimum amount of effort and time and as few personnel as possible. Quick deployment is usually not a necessity during floods, but it does come in handy when a number of smaller flood planes or cellars need to be emptied. The standard system HydroSub 150 will provide 3500 litres a minute, with a pressure of 10 bar. This means that transporting this amount of water can be done over more than 2500 meters through a single 150mm hose and still have enough pressure left to fill a tanker vehicle.

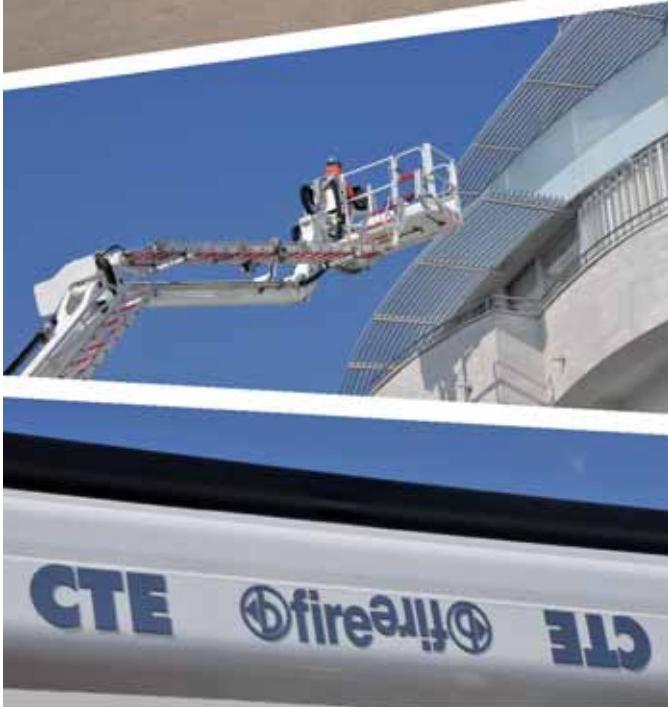
Preventing a flood is, of course, always the best option, but unfortunately there will always be a flood in some place where it was not expected. Flooding can have a serious impact on both the economy and the environment of any country; it disrupts businesses by blocking roads, floods offices, damages or destroys vehicles. The water is often contaminated and this presents a real danger to the environment and the public health. To minimise the impact, reducing or clearing the effects

of a flood is of prime importance and the right material needs to be selected to help achieve this.

The problem when trying to drain a flooded plain is usually access to the water; roads may have been damaged or become unstable, preventing big stationary pumping systems from being transported to the location by heavy trucks. Another problem is that most pumps rely on a suction line that connects the water to the pump. Sucking water has its limits and a maximum draft of 7.5 meters is the result.

Due to the increasing demand for mobile super high volume pumps, to reduce the impact of floods, the Flood Module was developed as an add-on system for the HydroSub 150. This allows the same HydroSub 150 to drive three flood pumps and generate a capacity of 50,000 litres a minute (lpm). This entire system – Hydrosub and Flood module – fits into one frame and can easily be transported and handled by means of one prime mover with a hook arm facility.

Because of its flexibility and the fact that it is a total solution, in addition to the pumps, hose layers, hoses and hose recovery unit are used increasingly by industrial firefighters, appreciating the advantages of mobile high volume water transport systems. The Hytrans fire system has proven to be very effective during incidents such as the Buncefield oil terminal fire in the UK, the Dalian pipeline explosion in China and, recently, the Fukushima Nuclear reactor disaster in Japan. This is due to their high capacity, quick deployment, easy operating, modular configuration and flexibility. Furthermore they can also be used as a backup system if the fire main is under construction or shut down for maintenance. With



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Besides a fast deployment, it is also a "must" to recover the system quickly. Most firefighters say that once the fire is extinguished they have all the time in the world to recover the used equipment. However if you look at training on the system, it is essential to make recovery quick and easy. When training is easy, it will be done more often and this will lead to more skilled people. The more training the better prepared for action during a real incident.

As storage tanks increased in diameter the demand for more water and higher pressure grew with it. This resulted in not only the development of much bigger pump units, but also in enlarging the diameter of the hoses to reduce friction loss over long distance; hose recovery units that are able to handle large diameter hose up to 300mm.



300mm hose with 300mm Multi Lug coupling



The largest unit in the Hytrans fire system product range at the moment is the HydroSub 1200, which has a capacity of 30,000 lpm at 12 bar. Due to the use of hydraulic driven submersible pumps there is no draft loss and therefore this capacity is also reached at a pump lift of 15 meters. The 60 meter of hydraulic lines allows you to get to the water in almost any situation.

As mobile high volume pumps are more and more used for direct firefighting it was necessary to develop a foam injection unit that is very accurate and can deal with these high flows. The PowerFoam can be either integrated in the large HydroSubs or supplied as a stand alone unit. The latter can be placed at any convenient point in the water line.

Due to the hydraulic driven foam gear pump and the accurate water flow measuring, the exact amount of foam concentrate is added to the water flow. Foam setting can be done from zero and six percent in increments of 0.1 percent. The system works in such a way that it is fully independent from pressure and water flow and adapts automatically if there is fluctuation. Accurate foam mixing is the result. It also features a return line that allows you to return the foam concentrate back to the container during training sessions. Training on the entire foam setting of the unit, as well as the foam logistics, can be carried out without wasting precious and expensive foam.

Mobile high volume pumping was, is and will be constantly developing in order to get bigger, better, faster and lighter equipment to help firefighters fulfill their tough job. **IFF**

Johan Kramer is Sales Manager at Hytrans Systems

For further information, go to www.hytransfiresystem.com

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The site is split into three easy to navigate portals, one for each title therefore you only have to view the areas of the fire industry that really interest you.

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Rescuing a casualty with a leg injury from a crane at Southampton docks during a training exercise



Keith Bellamy

Hampshire Fire and
Rescue Service

Technical Rope Rescue

Hampshire Fire and Rescue Service's technical rope rescue team provides expert support, working alongside firefighting crews to provide an increased capability for both rescue and safe working at height.

There are several different levels of rope rescue and working at height capabilities within Hampshire Fire and Rescue Service (HFRS). The current procedures have been in place since 2003 and ensure that we carry out our work safely and comply with the UK Work at Height Regulations.

All firefighters within HFRS are trained and able to set up safe working at height systems while attending fires or effecting rescues. The full time fire crews also have additional skills and equipment to be able to affect rescues from height by putting people in suspension, but with the limited capability of 50-metre ropes and simple mechanical advantage systems for raising.

The Technical Rope Section consists of members from the HFRS Urban Search and Rescue Team, which provides a technical rope rescue capability that works in conjunction with the fire crews' systems. There are 12 members in the section with four being on call at any one time. Members of the team live across the county and mobilise direct to incidents from home or their place of work. The shift cover is for a two week period on call,

followed by two weeks off, followed by two weeks on 'second' call for large scale incidents.

The Technical Rope Section can mobilise to incidents where a rope rescue is already in progress and compliment the systems already in use with additional capability. If required, we can add tripods, deviations, cable ways and mechanical advantage systems, plus other equipment to the rope systems already in use without having to disconnect or change what is already in place. The Technical Rope Section also provides additional operational capabilities in several areas, such as:

- Specialised advice to an incident commander regarding the existing and anticipated use of safe working at height or rope rescue systems by fire crews.
- Advice at incidents where safe working at height systems need to be created for work on roof tops and on edges.
- Work in suspension on 200-metre ropes.
- Work in suspension in a non-vertical situation using cableways.
- Safe entry/exit to difficult access locations and confined spaces.

Stretcher bound casualty and rescuer being lowered over the edge at Grimpday 2011



- Enhanced casualty packaging equipment and techniques, such as specialist confined space and bariatric stretchers.
- Safe handling and delivery of skilled personnel from other organisations (such as doctors or Hazard Area Response Team paramedics) to medicate a trapped casualty in difficult to access locations.
- Provide operational support to other specialist groups and agencies.

There is a hierarchical system that we follow on rope rescues and it has proved to be very effective and efficient. If the rescuer has to be put in suspension, wherever possible the lowering and raising of the rescuer and casualty is done remotely by dedicated rope system operators; one for the primary system and one for the independent safety system. This can be carried out by full time firefighters and enables the rescuer to give better treatment and care to the casualty as the rescuer does not need to operate any systems.

Good communication between the rescuer and system operator is critical for this and, when practiced regularly, becomes the norm. If this type of operation is not achievable or suitable then the rescuer can control his primary system while the independent safety system is controlled remotely. As a last resort we would commit a rescuer controlling both his own primary and independent safety systems. This increases the workload for the rescuer quite considerably but is still an option. The latter two ways of committing a rescuer are only carried out by the Technical Rope Section.

Equipment

All HFRS fire appliances carry a safe working at height pack that contains a 50-meter rope, various wire and fabric slings, karabiners, harnesses and Y

lanyards with fall arrest devices. This equipment enables the crews to set up work restraint systems where needed to prevent falls from height. When this is not achievable, a fall arresting system can be set up with the same equipment to protect themselves from falls from height.

Fire appliances crewed by full time firefighters have additional items in their safe working at height packs to enable them to carry out rescues from height and set up work positioning systems where people are put into suspension on rope systems. These items are a rope control device, casualty harness, rope grab and pulleys. Simple mechanical advantage systems can be set up using the pulleys and rope grab to enable the crew to raise the rescuer and casualty when required. To achieve work positioning two fire appliances are mobilised to the incident and this provides the amount of equipment and personnel required.

The Technical Rope Section carries considerably more equipment to enable them to provide the additional specialist capabilities mentioned before. The team equipment is stored on a strategically positioned appliance, which is stationed centrally within the county.

The kit includes a selection of 100-meter and 200-meter ropes, various rope control devices, a variety of wire and fabric slings of varying lengths, rigging plates, several different types of pulleys ranging from small single type to large triple pulleys, an Ozpod luffing frame that can also be used as a tripod, anchor bolts, girder clamps, ground anchor plates and pins. In addition to this each team member has a set of personal equipment that includes a harness, fall arrest lanyards, work positioning lanyard, rope control device, rope grab, pulley, fabric slings and karabiners.

A selection of casualty packaging equipment is also held on the appliance as part of the rescue equipment. We have a Bell stretcher that can be used for large casualties or it can be set up as a work platform on the side of a building or cliff. The stretcher used the most frequently is the React Slix in conjunction with a scoop stretcher. It is kept set up ready for use with the flexible rigging attached to enable it to be moved from the vertical to horizontal and back again by the rescuer while in suspension. As well as basic first aid equipment we also carry vacuum splints and a full body vacuum mattress.

Training

After successfully completing initial training, all firefighters regularly participate in ongoing rope pack training (as this is a safety critical area of operations) and they are assessed on all the areas of working at height on a six-monthly basis.

The technical progression from full time firefighter to the much higher level of operations required within the Technical Rope Section is taken on a 15-day course. Team members then have to attend a minimum of at least one full day training session every month and be assessed on all their areas of working at height on a six-monthly basis. This is considerably more than the firefighter level and the assessments are continuously carried out on a flexible rolling programme to allow variations in training venues and scenarios.

Training scenarios that enable the team to gain experience of setting up in different types of location or to refresh basic skills are undertaken in



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The Ozpod being used to make edge negotiation easier for rescuer and casualty during a training exercise



a variety of venues. These include fire service facilities across the county and private sites where we have been granted permission for access. These vary from partly demolished industrial buildings where we drill and bolt fixings to use as anchors without having to worry about the consequences of the damage, to training at the top of the 80-meter cranes at Southampton Dock.

The organisation of training at private sites takes more work in building relationships with the owners and site staff, but is extremely worthwhile as it gives us realistic training venues and familiarises us with places that we might get called to in the future. Also, this gives us the opportunity to meet other people who work in industries at height and obtain an insight into what potential problems and issues we may be faced with during an incident.

Competitions

Our training has taken us to both national and international rope rescue competitions. Our team started by entering the UK Rescue Organisation Rope Rescue Challenges and for the three years we entered we won several events and categories. We have won best overall team twice and second-best once; Best Medic twice, and Best Officer in Charge on all occasions. On the last event we entered there was a technical category, which we also won.

For the last five years the team has also entered Grimpday, which is a rope rescue challenge held in Namur, Belgium. This all-day event has teams from across Europe taking part where they have to work around a course taking their stretcher-bound casualty and all their equipment with them. Over the course, the team has to utilise its equipment to get themselves through a variety of different scenarios ranging from ascending walls to crossing rivers. In addition to the team trial there is also a technical skills test for individual team members where they have to work through various scenarios on their own. We encourage our new team

members to come along to this event and take part as it has huge benefits for them in enhancing team working and increasing confidence in the use of the equipment.

Incidents

Since its introduction in Hampshire eight years ago the current rope rescue capabilities have been used on a huge variety of incidents from animal rescues (such as the obligatory cat up a tree) to responding to a man who had fallen 15 metres down a well.

In the last couple of years we have assisted at numerous incidents where cars have left the road and ended up at the bottom of steep embankments. This initially involves setting up safe working at height systems to access the vehicle. We then went on to utilise the rope rescue systems in order to get the casualties

safely back up the slope and over into the hands of our colleagues in the ambulance service.

We have also responded to two incidents to rescue tree surgeons from the very top of tree trunks that have had all the branches removed. One individual was not only trapped at the pinnacle but had a suspected fracture to his femur and had become suspended in his harness after being hit by a falling log that he had just removed. This not only made access extremely difficult but also meant that the movement of the casualty and our actions had to be carefully considered to ensure that his injuries were not made any worse. He was successfully rescued using a combination of rope rescue techniques and being suspended from the cage of an aerial ladder platform that had been mobilised to the scene.

Our Bell stretcher has also been called on several times to help with the rescue of bariatric patients from various places. On occasion we have had to use rope systems to assist with moving them once they are in the stretcher.

We have a very good working relationship with the police and have been called upon on several occasions to assist them with body recoveries where there has been a need to use safe working at height systems to gain access to the bodies.

Most of our rope rescue related calls are to give advice and provide safe working at height systems for fire crews that are at incidents where they need a greater capability than they can set up with their limited resources.

We continually strive to be the best at what we do. As a result, our systems of work and techniques have adapted and become extremely refined, which has led to HFRS operational procedures being updated to include these improved techniques. For example, the service now has a stretcher set up that is very versatile in that the rescuer in suspension with the casualty can easily change the orientation of the stretcher from horizontal to vertical and back again whilst they are being lowered or raised through tight spaces. **IFF**

Section Leader **Keith Bellamy** is with the Urban Search and Rescue team at Hampshire Fire and Rescue Service

For further information, go to www.hantsfire.gov.uk

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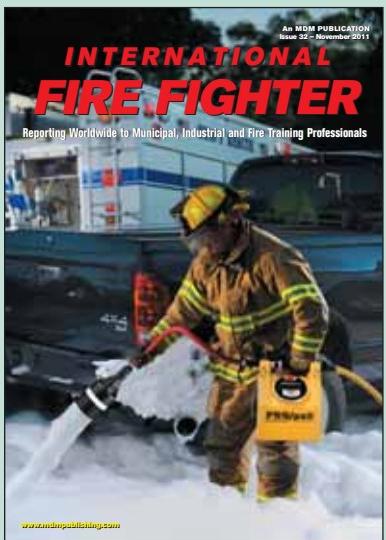
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